DOCUMENT RESUME

ED 304 118 IR 013 677

TITLE	7-9 Computer Awareness. Interim Guide.
INSTITUTION	Manitoba Dept. of Education, Winnipeg. Computer Services Branch.
PUB DATE	85
NOTE	457p.; For the grade 4-6 guide, see IR 013 676.
PUB TYPE	Guides - Classroom Use - Guides (For Teachers) (052) -- Reports - Descriptive (141)
EDRS PRICE	MF01/PC19 Plus Postage.
DESCRIPTORS	*Computer Games; *Computer Literacy; Discovery Learning; Foreign Countries; Junior High Schools; *Learning Activities; *Microcomputers; *Program Implementation; Programing; Word Processing
IDENTIFIERS	BASIC Programing Language; LOGO Programing Language; Manitoba; Spreadsheets

ABSTRACT

This guide was developed to assist teachers in achieving goals related to the development of computer awareness in junior high school students in the Canadian province of Manitoba. An overview of the program describes a set of basic concepts, skills, and attitudes relating to computer technology, and provides information on activities that can be used in teaching these concepts, skills, and attitudes. The computer awareness program itself is divided into five units: (1) Getting Started, which introduces the computer and the basic skills necessary to operate the computer; (2) What Is a Computer, which provides students with information about the parts of the computer; (3) How Computers Have Developed, which provides students with background to the historical development of computing aids; (4) How To Make Computers Work for You, which provides students with hands-on experience using BASIC, LOGO, and three personal productivity tools--word processing, database management, and electronic spreadsheet analysis; and (5) Computers in Our Lives, which explores the advantages, limitations, uses and implications of computer use through a series of classroom activities and simulations. The text is supplemented by various illustrations and diagrams, and a resource section provides lists of 13 printed sources and the names and addresses of 8 suppliers. (EW)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED304118

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☑ This document has been reproduced as received from the person or organization originating it
☐ Minor changes have been made to improve reproduction quality
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

1985

7-9 computer awareness

interim guide

manitoba education

IR013677

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
K.A. Cosens
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

7-9 computer awareness

interim guide

THIS GUIDE IS SUBJECT TO REVISION ON THE BASIS OF INFORMATION RECEIVED FROM SCHOOLS. IT IS EXPECTED THAT MODIFICATIONS WILL NOT BE IN THE DESIGN OF THE PROGRAM. RATHER, CHANGES MAY BE MADE IN AREAS CONCERNING STRATEGIES, RESOURCE MATERIALS, AND IMPLEMENTATION.

manitoba education 1985

ISBN 0-7711-0269-0

5

ACKNOWLEDGEMENTS

Sincere appreciation is extended to the K-9 Computer Awareness Committee, which developed the program and prepared the guidelines for 7-9 Computer Awareness.

Members of the committee:

Marlene Batke
Lord Roberts School
Winnipeg School Division No. 1

Dona Burron
John Pritchard School
River East School Division No. 9

*Georgina Falzarano
Park Circle School
Transcona-Springfield School Division No. 12

Frank Foidart
St. Alphonse School
Mountain School Division No. 28

Dave Garrity (until June, 1983)
Shamrock School
St. Boniface School Division No. 4

*Brian Metcalfe
Computer Consultant
Winnipeg School Division No. 1

Evelyn Podolsky
Bertrun E. Glavin School
River East School Division No. 9

*Barry Reilly
Vincent Massey High School
Brandon School Division No. 40

*Connie Shaver
Spring Valley School
St. James-Assiniboia School Division No. 2

Mark Singleton
Resource Coordinator
Tiger Hills School Division No. 29

Karen Yamada
Oakenwald School
Fort Garry School Division No. 5

*Indicates members of the 7-9 sub-committee.

Consultants to the committee:

Cheryl Prokopanko
Wayne Watt
Curriculum Development and Implementation Branch, Manitoba Education
and
Wendy Wood, Educational Technology Program, Industry, Trade and Technology

Appreciation also is extended to the many teachers who provided input to the committee and in particular to the following teachers who participated in piloting the guide. Their patience, dedication and contribution made this interim guide possible.

Alex Blando
Windsor School
St. Vital School Division No. 6

Ron Bodner
Robert Andrews School
River East School Division No. 9

John Carley
Carman Collegiate
Midland School Division No. 25

Leon Diller
Harrison Junior High School
Brandon School Division No. 40

Herb Heppner
Selkirk Junior High School
Lord Selkirk School Division No. 11

Michael Kiedyk
Selkirk Junior High School
Lord Selkirk School Division No. 11

Jack Laferty
Niakwa Place School
St. Boniface School Division No. 4

Clarence Lazaruk
Inglis School
Pelly Trail School Division No. 37

Dale Robinson
Miami Collegiate
Midland School Division No. 25

Grant Schettler
Elkhorn School
Fort la Bosse School Division No. 41

Rick Skarban
Riverside School
Mystery Lake School District No. 2355

Tom Skinner
Minto School
Turtle Mountain School Division No. 44

Margot Tass
Nordale School
Norwood School Division No. 8

Dorothy Thiessen
Killarney School
Turtle Mountain School Division No. 44

Many thanks to Caroline Trottier for excellent cooperation and patience in the preparation of all graphics associated with this document.

8

9

CONTENTS

PROGRAM OVERVIEW 1

- Rationale 3
- Goals 4
- Description and Development 4
- Time Allotment 6
- Objectives for 7-9 Computer Awareness 7

PROGRAM IMPLEMENTATION 13

- Hardware 15
- Gender Equity 15
- Special Needs 16
- Student Evaluation 17

INTEGRATION 19

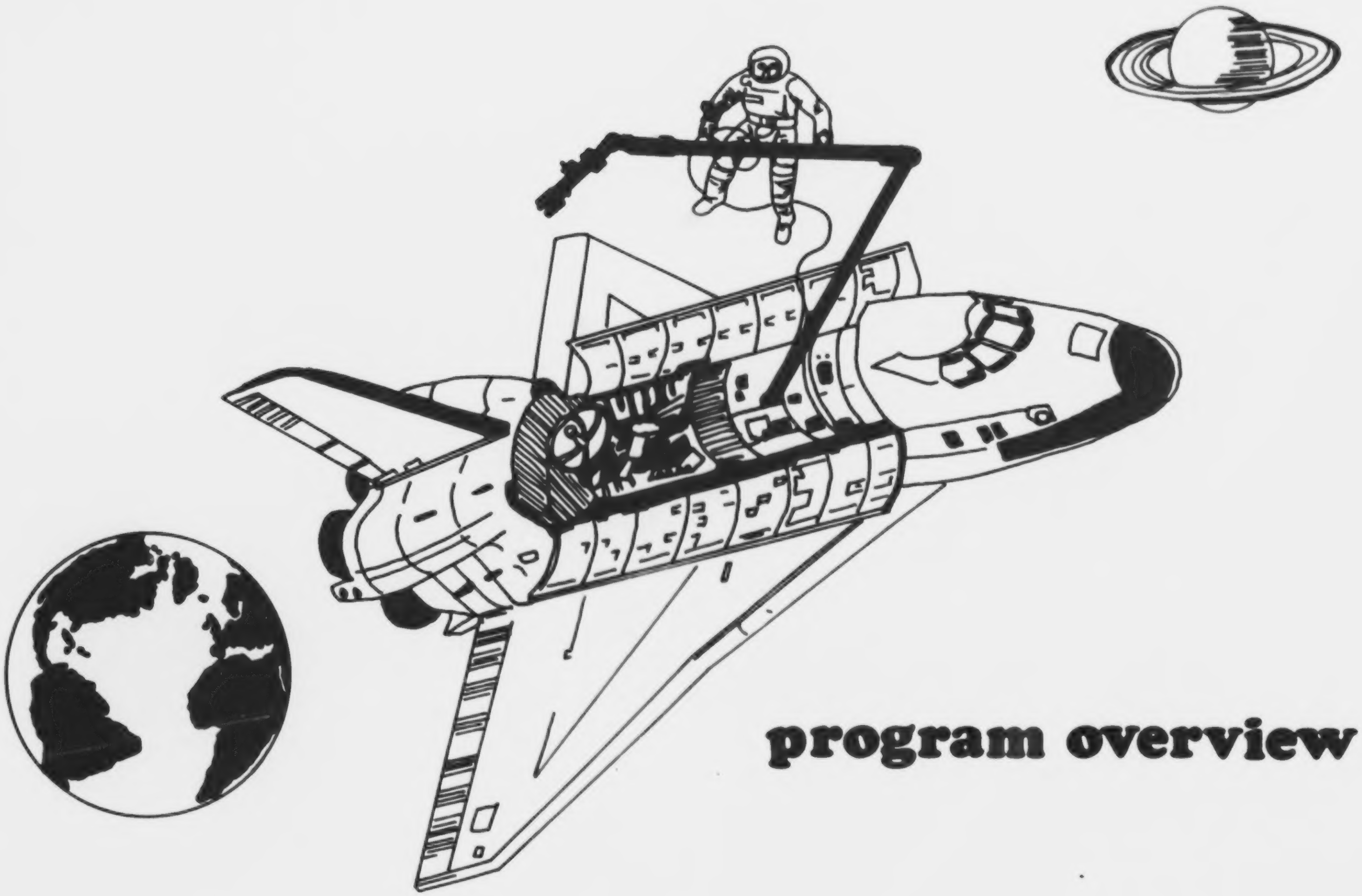
- Integration 21
- 7-9 Computer Awareness Integration Chart 22

PROGRAM OUTLINE 29

- Unit 1: Getting Started! 31
- Unit II: What Is a Computer? 47
- Unit III: How Computers Have Developed 61
- Unit IV: How to Make Computers Work For You 69
- Unit V: Computers In Our Lives 145

ACTIVITIES 151

RESOURCE MATERIALS 299



program overview

RATIONALE

This guide was developed to assist teachers in achieving the goals related to the development of computer awareness in junior high school students. For purposes of this document the definition of "computer awareness" will be that proposed by the Manitoba Computer Awareness Task Force (K-12) in March, 1982. The Task Force considered that computer awareness includes:

- an understanding of what computers can and cannot do;
- interaction and communication with computers;
- using computers to solve problems; and
- using computers in the educational setting.

The underlying aim of computer awareness is to promote an understanding of the uses of computer technology in the home, in the school, and in the community as well as a knowledge of some of the effects of this technology.

The development of the Manitoba K-9 Computer Awareness curriculum was the result of both the philosophical support of the Computer Awareness Task Force (K-12) and the expressed need from within the educational community. This need was demonstrated by the development of school initiated computer awareness programs. In turn, these school initiated programs were the response of the educational community to the need expressed by students and parents to emphasize a more adequate preparation for a society which is a user of computer technology.

The 7-9 Computer Awareness guide is one part of a three-part K-9 Computer Awareness program intended to provide the teacher with enough information to establish introductory computer awareness for all students in these grades. The K-9 program has been divided into three guides, namely, K-3, 4-6, and 7-9.

Consider 7-9 Computer Awareness to be:

1. optional rather than mandatory,
2. a series of five units requiring 20-25 hours for each of the three years,
3. taught using either a discrete or an integrated approach,
4. a scope and sequence of objectives divided according to levels 1, 2, 3 and according to expected student mastery (introduction, expansion, proficiency), as well as
5. a sampling of activities suggested for use at the various levels.

Computer awareness should not be interpreted as the specialization of one subject area or of one group of educators. Rather, all classroom teachers should be encouraged to become involved in using computer technology so that it can achieve its appropriate place in serving education as a tool to aid student learning and instruction in the classroom.

The 7-9 Computer Awareness guide addresses the diverse backgrounds of both students and teachers as well as the various types and quantities of computer hardware and courseware. Some of the objectives outlined in this document can be achieved without the use of a computer. However, hands-on activities are highly recommended in order to provide concrete experiences and to increase motivation.

The phenomenon of increasing knowledge and sophistication of students with respect to educational computing in general and to computer awareness in particular is anticipated to result in the need for revision on a frequent and on-going basis.

Educators might still ask, "But why teach computer awareness? What part does computer awareness play in the junior high school curricula?" One valid and overwhelmingly compelling reason for including computer awareness is that it becomes the initial step in the students' control over and use of a powerful and emerging technology.

GOALS

Based on the computer awareness model for Manitoba as defined in the Report of the Computer Awareness Task Force (K-12) computer awareness for grades K-9 has been designed to promote familiarity with computers, ability to interact and to communicate with computers, and understanding of computer applications and implications within society.

In support of these aims, K-9 Computer Awareness has the following specific goals:

1. To become familiar with the computer as part of the learning environment.
2. To become comfortable interacting with a computer.
3. To demonstrate appropriate care and handling of computer systems.
4. To acquire a knowledge of the components of a computer system.
5. To appreciate the development of computing devices as they increase in complexity and capability.
6. To become aware of possible and probable future uses and development of computers.
7. To develop skills in creative problem-solving.
8. To achieve the ability to solve problems through the use of educational computing.
9. To appreciate the extensive use of computer technology in homes, schools, local communities, and society in general.
10. To become aware of the advantages and limitations of computer technology.

DESCRIPTION AND DEVELOPMENT

THE GUIDE

The Program Outline section of the 7-9 Computer Awareness guide describes a set of basic concepts, skills and attitudes related to computer technology and arranges these in a three-column format:

1. The objectives, outlined on the left-hand side of these pages, identify those concepts, skills, and attitudes central to the achievement of computer awareness in the junior high grades. Each objective is followed by the desired expectation of student knowledge or mastery. "Introduction" implies first exposure, "Expansion" indicates an extension to new areas built on knowledge gained during a previous exposure in that same or a preceding school year, and "Proficiency" denotes an appropriate student competence.

2. Additional information for the teacher has been included in the middle of these pages under the heading "Notes and Explanations." Details relating to background knowledge, to intended scope, and to classroom activities have been included under this heading. Activities are either in the form of suggestions which the classroom teacher may develop according to student needs (these suggestions are inset and starred *) or in the form of fully developed activities found in the Activities section of the guide. Fully developed activities are provided courtesy of committee members, pilot teachers and other interested educators.

3. All developed activities are coded in the third column as follows:

   II-5-1
   Ma/Sc

   II-5-1 indicates that the activity is part of Unit II, accompanies Objective 5 and is the 1st developed activity for that objective. Integration information is found beneath this coding. In the example, Ma/Sc indicates that Activity II-5-1 could be integrated with either Mathematics or Science. The teacher could then refer to the 7-9 Computer Awareness Integration Chart found in the Integration section of this guide to determine the specific concepts/skills in the Mathematics or Science curricula with which that particular activity could be integrated.

   Experience gained during the pilot program suggests that teachers used the guide in two distinct ways. Some chose to follow the sequence of units and objectives as presented. Others preferred to select and to combine objectives from a number of units in an attempt to meet the particular needs of their students. The second method provided greater opportunity for integration of computer awareness with other junior high subject areas. For this reason, it is necessary to emphasize that the 7-9 Computer Awareness units need be taught neither in a block nor in the sequence presented in this guide.

UNIT DESCRIPTIONS

In order for junior high school students to become comfortable as computer users it is necessary to provide ample opportunity for "hands-on" experience with a microcomputer wherever possible throughout the five units which comprise 7-9 Computer Awareness.

Unit I: GETTING STARTED! 5%

This unit is designed to provide the student with the necessary skills for operation of a microcomputer including appropriate care and handling of the microcomputer system, using the keyboard and loading software from cassette or diskette.

Unit II: WHAT IS A COMPUTER? 15%

The purpose of this unit is to provide the student with information about the parts of a computer system--the computer itself and the peripheral devices which may be used with it. In addition, students will recognize that computers operate only through instructions provided by operators and that various computer languages are available for this interaction. Much of this topic involves presentation and use of new vocabulary relevant to these topics.

Unit III: HOW COMPUTERS HAVE DEVELOPED 10%

This unit provides students with a background to the development of computing aids from early times to present day. Students should be aware of the gradual technological development of computers through the years. Emphasis is to be placed on the trends associated with this development.

Unit IV: HOW TO MAKE COMPUTERS WORK FOR YOU 50%

This unit is designed to provide students with "hands-on" computer experience. The unit is divided into three sections; namely, BASIC, Logo and Tool Uses. A choice must be made from these three sections:

- BASIC Section. Students are to recognize the function, to predict the output, and to construct simple problems applying specified constructs using the BASIC programming language. Emphasis is to be placed on problem solving.

  OR

- Logo Section. Students could continue with or be introduced to a full version of Logo. Emphasis is to be placed on top-down problem solving involving repetition, recursion, variables, coordinate geometry, and list processing.

  OR

- Tool Uses Section. Students are to be exposed to three personal productivity tools; namely, word processing, database management, and electronic spreadsheet analysis.

Unit V: COMPUTERS IN OUR LIVES 20%

The recent technological explosion has brought individuals into daily contact with computers in their workplace, schools, and homes. Therefore, students should become increasingly aware of the advantages, limitations, uses, and implications of this computer technology. This unit is designed to expose students to basic applications and corresponding implications of computer use through a series of classroom activities and simulations.

TIME ALLOTMENT

The K-9 Computer Awareness program has been designed as a series of three optional guides developed for the following grade levels and requiring the identified contact times.

Grade Levels	Contact Time
K-3	10-15 hours per year
4-6	15-20 hours per year
7-9	20-25 hours per year

The recommended contact time for 7-9 Computer Awareness should be distributed over the units in the following way:

- Unit I: Getting Started! 5%
- Unit II: What Is A Computer? 15%
- Unit III: How Computers Have Developed 10%
- Unit IV: How To Make Computers Work For You 50%
- Unit V: Computers in Our Lives 20%

OBJECTIVES FOR 7-9 COMPUTER AWARENESS

	Level 1	Level 2	Level 3
I. GETTING STARTED! - 5%			
The student should be able:			
1. to identify and to show how to care for the components of the microcomputer system;	Proficiency		
2. to explain the rules for the use of the microcomputer system;	Proficiency		
3. to explain and to show how to switch on a microcomputer system;	Proficiency		
4. to demonstrate the use of all keys on the microcomputer keyboard in immediate mode;	Introduction	Expansion	Expansion
5. to LOAD and to RUN computer software from diskette or cassette;	Introduction	Proficiency	
6. to be aware of proper keyboarding techniques.	Introduction	Expansion	Expansion
II. WHAT IS A COMPUTER? - 15%			
The student should be able:			
1. to interpret the operation of everyday activities in terms of the input-processing-output cycle;	Proficiency		

	Level 1	Level 2	Level 3
2. to relate the major parts of a computer to the input-processing-output cycle and to describe the operation of these parts;	Introduction	Expansion	Expansion
3. to identify and to describe the use of different types of input and/or output devices;		Introduction	Expansion
4. to describe the interrelationships between the parts of the central processing unit;			Introduction
5. to compare the memory capacity, physical size, and cost of mainframe computers, minicomputers, and microcomputers;			Introduction
6. to identify similarities and differences among computers, calculators, and electronic games;	Introduction	Expansion	
7. to identify different types of microcomputer data storage media;			Introduction
8. to recognize that a computer follows instructions from a program written by a person using a programming language;		Introduction	Expansion
9. to translate between base ten and binary numbers.		Introduction	Expansion

III. HOW COMPUTERS HAVE DEVELOPED - 10%

The student should be able:

1. to recognize significant developments which contributed to the evolution of the modern electronic computer;	Introduction	Expansion	
2. to list and to discuss the characteristics of the four generations of computers;		Introduction	Expansion
3. to become increasingly aware of the trends in computer development.			Introduction

IV. HOW TO MAKE COMPUTERS WORK FOR YOU - 50%

In this unit, a choice must be made from among the three sections: BASIC, Logo, or Tool Uses.

BASIC SECTION

The student should be able:

	Level 1	Level 2	Level 3
B1. to demonstrate the use of the microcomputer as a calculator;	Introduction	Expansion	
B2. to demonstrate the use of all keys on the microcomputer keyboard in programming mode;	Introduction	Expansion	Expansion
B3. to select and to use computer operating commands as required;	Introduction	Expansion	Expansion
B4. to formulate a flowchart as a diagrammatic representation of a computer program;	Introduction	Expansion	Expansion
B5. to recognize the function, predict the output, and construct a BASIC program applying the statements PRINT, GOTO, FOR-NEXT, as well as programming punctuation techniques;	Introduction	Expansion	Expansion
B6. to recognize the function, predict the output, and construct a BASIC program applying numeric and string variables as well as the INPUT and the IF...THEN statements;		Introduction	Expansion

	Level 1	Level 2	Level 3
B7. to recognize the function, predict the output, and construct a BASIC program applying the STEP instruction and the READ/DATA statement;			Introduction
B8. to document the structure and logic of a BASIC program using the REM statement.			Introduction

LOGO SECTION

The student should be able:

	Level 1	Level 2	Level 3
L1. to manipulate a robotic device;	Introduction		
L2. to manipulate the Logo "screen turtle" in immediate mode;	Introduction	Expansion	Expansion
L3. to use the REPEAT command;	Introduction	Expansion	
L4. to create, to edit, and to save Logo procedures, subprocedures, and superprocedures;	Introduction	Expansion	Expansion
L5. to create recursive Logo procedures;	Introduction	Expansion	Expansion
L6. to write Logo procedures containing variables;	Introduction	Expansion	Expansion
L7. to use Logo commands involving coordinate geometry;		Introduction	
L8. to understand and to use some list-processing capabilities of Logo.			Introduction

TOOL USES SECTION

The student should be able:

	Level 1	Level 2	Level 3
T1. to use a computer to manipulate and to edit textual material;	Introduction	Expansion	Expansion

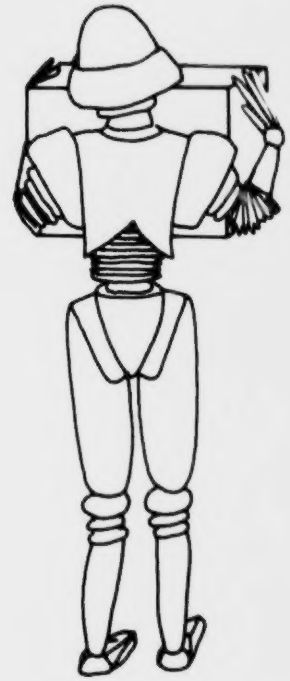
	Level 1	Level 2	Level 3
T2. to use a computer to store, to sort, and to retrieve information;		Introduction	Expansion
T3. to use a computer to analyze and to predict from numeric data.			Introduction

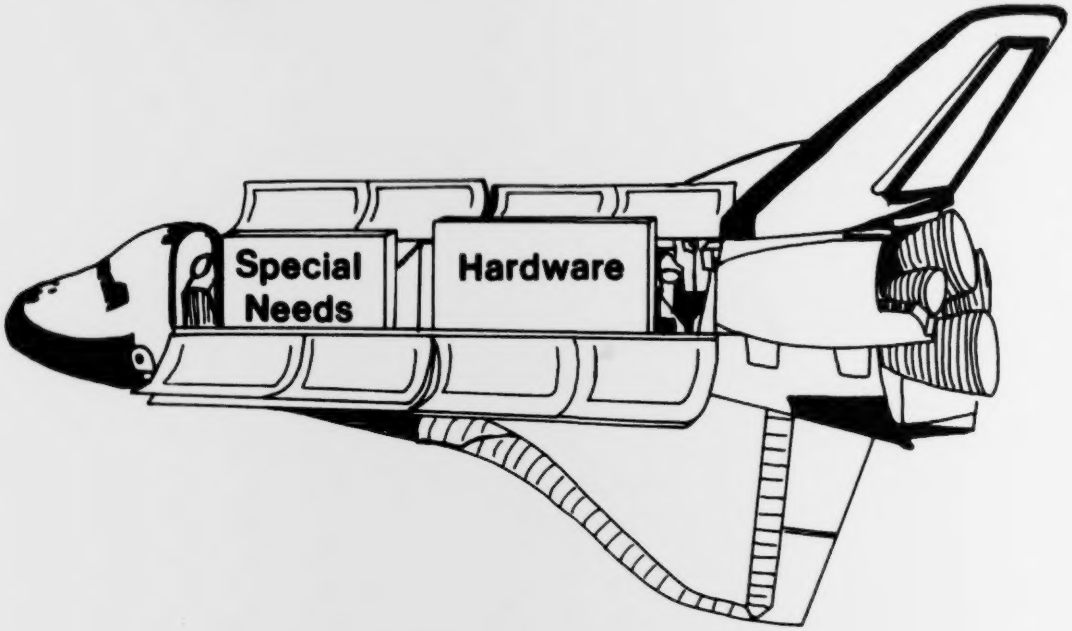
---

V. COMPUTERS IN OUR LIVES - 20%

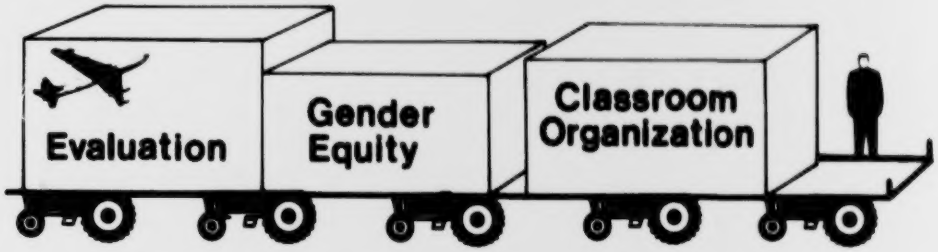
The student should be able:

	Level 1	Level 2	Level 3
1. to identify common devices which use computer technology in the school and in the home;	Introduction		
2. to discuss how computers are used in the community;	Introduction	Expansion	
3. to describe how computers are related to leisure time activities;	Introduction	Expansion	
4. to identify computer-related careers;			Introduction
5. to assess possible negative consequences of the application of computers in society;			Introduction
6. to debate the advantages and limitations of computers;		Introduction	Expansion
7. to predict how computers might be used in the future.		Introduction	Expansion




Special Needs
Hardware

program implementation


Evaluation
Gender Equity
Classroom Organization

HARDWARE

The 1983/84 Survey of Computer Hardware in Manitoba schools indicated that approximately three quarters of all Manitoba schools use computers in the teaching and learning process. The annual increase in the amount of computer hardware in Manitoba schools results in a corresponding decrease in the provincial student-to-computer ratio which stood at 60:1 for 1983/84.

As a result of pilot teacher observations it is recommended that 7-9 Computer Awareness classes have access to at least one microcomputer, monitor and disk drive for every six students. Teachers should be aware that the majority of software is available primarily on diskette and that the disk drive is essential for quick, easy and reliable loading of this software. A colour monitor/television may be required for effective use of software which is colour dependent. However, a monochrome monitor is preferable for textual displays such as those found in BASIC programming, word processing, database management and spreadsheets. In addition, each class should have access to a large (> 20") black-and-white or colour monitor/television to be attached to one microcomputer system to make computer screen output visible to large groups. For 7-9 Computer Awareness, a dot-matrix printer is recommended rather than a letter quality printer because the dot-matrix is generally faster and prints graphics as well as text. The printer might be shared within the school but should be available to allow the production of hard copies of student work.

Other hardware devices that would aid in the successful implementation of 7-9 Computer Awareness include other microcomputer systems, robotic devices, graphics tablets, modems, and alternative input devices. The teacher should be aware that special software may be required to operate these devices.

The placement of computer hardware within the school depends upon how many microcomputers are available and upon the need to share these. Placement strategies should remain flexible to accommodate the changing needs for access to microcomputer hardware within a 7-9 school. Some strategies include:

1. Microcomputers in a Central Area.
   This central area could be the library, a computer classroom lab or some other supervised area. A disadvantage of the central area is that it may become the teaching domain of one teacher who may discourage the use of this area by other teachers.

2. Microcomputers Permanently in the Classroom.
   This ensures that the microcomputer is always available to the teacher and students. A disadvantage is that the individual hands-on time may be reduced.

3. Microcomputers Moved Into and Out of the Classroom.
   The most common means of sharing computer hardware amongst teachers is to have the microcomputer systems move from room to room. The systems could be placed on wheeled carts having a raised edge to prevent components being knocked off accidentally. Disadvantages may include increased inconvenience and maintenance costs.

GENDER EQUITY

The use of microcomputers in the schools has been seen as a potential equalizer of high-tech opportunity for girls and boys. This potential can only be realized if teachers balance their choice of educational courseware, if teachers provide opportunities for positive computing experiences for both sexes, and if both female and male students learn to use the computer as a tool.

Teachers of 7-9 Computer Awareness should ensure that computer activities provide a positive experience for both boys and girls and that students of both sexes have equal access to the computers in the classroom. Procedures for ensuring that every student gets a turn, that pairs of students working together learn to share equally, that aggressive students do not push aside more hesitant ones, and that computer access is not provided only for the gifted or to the slower learner are all important considerations. In addition, female Computer Awareness teachers have an excellent opportunity to provide a positive role model for students in their classes.

Students who learn to use the microcomputer as an applications tool to create graphic, musical, and written compositions or who learn to program the microcomputer are placing themselves in control of their computing experience. Teachers of 7-9 Computer Awareness should ensure that both girls and boys have these opportunities and that classroom computing experiences portray the microcomputer as a general purpose, gender-neutral, intellectual tool. In addition, materials used in 7-9 Computer Awareness should not reinforce sexual stereotypes, nor should they contribute to the image of the computer as being male or for males only.

Teachers will find in taking the precautions discussed earlier that boys and girls will tend to use computers equally in grades 7-9 and at the same time will lay the foundations for gender equity in future computer studies.

SPECIAL NEEDS

The mainstreaming of students with special needs into the classroom necessitates special considerations on the part of educators. Through the use of individualized computer-based courseware, educators can accommodate many of these special considerations. The 7-9 Computer Awareness interim guide considers three general classes of special needs students; the slower learner, the handicapped/disabled, and the gifted.

The slower learner should be encouraged by the teacher to join in classroom computer awareness activities. However, provision should be made for the slower learner to have additional hands-on time with appropriate courseware. The use of quality courseware can be highly motivating for the slower learner by presenting basic facts in new and different ways. Through random selection or random generation, a single piece of courseware can present similar yet different problems or questions each time it is used. The immediate feedback and interaction of the courseware can be used to keep the student on-task and engaged for longer periods of time than that achieved using traditional methods.

The teacher should find that a high degree of individualized instruction can be provided for the slower learner through the use of educational courseware. The teacher may be able to customize the courseware by setting the limits for problems to be presented to the student as well as the level of mastery to be achieved. Success at an appropriate level of difficulty may lead to increased personal self-esteem and motivation.

The handicapped/disabled student should be encouraged to participate in the class activities of 7-9 Computer Awareness as much as possible given the nature of the handicap/disability. Modifications may have to be made in order to allow the handicapped/disabled student access to the microcomputer hardware.

Various devices are available which adjust the kind of input accepted by the microcomputer. These include plexiglass masks which cover the keyboard to prevent accidental keystrokes by students lacking in fine motor control or coordination. Touch sensitive screens, joysticks, head sticks, braille keyboards, voice-activated input devices, trackball devices, aspiration devices, Bliss symbolic keyboards, and button boxes are other examples of input devices which can make the microcomputer acessible to the student with a handicap/disability.

On the other hand, various devices are available which adjust the nature of the output produced by the microcomputer. These include magnifying devices, printers which produce enlarged text for the visually impaired, and speech synthesizers or Braille embossers for the blind student.

The achievement of control over a microcomputer may improve the self-image of the handicapped/disabled student. The teacher should consider training such a student to use the microcomputer before introducing it to the rest of the class.

The microcomputer and appropriate educational courseware can be used to enrich the learning environment of the gifted student. Quality courseware can challenge a gifted student to employ creative problem-solving techniques involving hypothesis, analysis, synthesis, and deduction. Electronic databases can assist the gifted student in the organization, manipulation and retrieval of information. Word processing software can encourage the students to revise and edit written work, producing a clean copy after rewriting is complete. Tutorial courseware can enhance learning experiences in a lateral direction, expanding on concepts or skills which have been covered previously. Computer simulations can allow the gifted student to become immersed in life-like situations and to experiment with real-life processes without leaving the classroom. Graphics-based computer languages can be used by the student to explore "turtle" geometry and to begin to develop the top-down technique of problem solving.

STUDENT EVALUATION

Generally, evaluation is conducted to determine how well a student has mastered the knowledge and has acquired the skills and attitudes contained within a program of studies. On this basis, a meaningful evaluation of student participation in 7-9 Computer Awareness must be based on student exposure to the particular objectives found within this guide. At the junior high school level, it is recommended that a student be evaluated informally as well as by using more formal techniques.

One informal method of evaluation is teacher observation. The teacher may observe the extent to which a student participates in class discussions, the degree of student initiative in researching and sharing information and materials, and the ability of a student to verbalize concepts and skills.

Such observation could seek answers to the following questions:

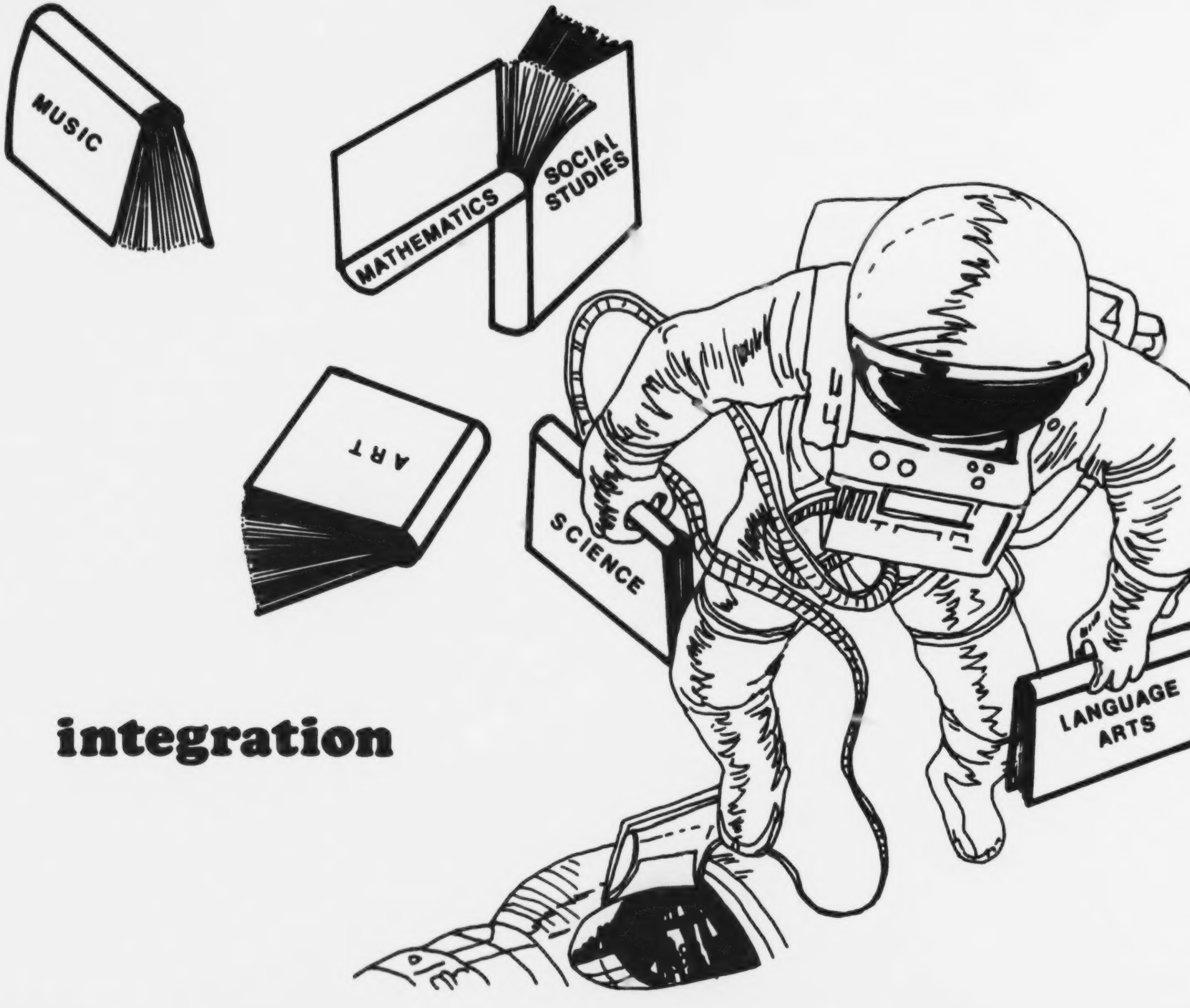
- Does the student feel comfortable with and enjoy using a microcomputer?
- Is the student able to work independently on a microcomputer?
- Does the student cooperate with other students in the use of a microcomputer?
- Does the student engage in discussion of computer-related topics?

- Does the student demonstrate an understanding of computer use in the home, school, and community?

Another method of informal student evaluation is the anecdotal record. The anecdotal record contains short notes by the teacher recording a change in attitude, the development of understanding, as well as evidence of the application of knowledge to new situations. The teacher can conduct short discussions with individual students or small groups in order to acquire this information.

Another useful evaluative tool is a student file which contains a collection of work gathered over time. Such a file may indicate important changes in the knowledge, skills, or attitudes of the student with respect to computer technology. The information in the student file can be reported to parents or displayed during a parent's visit to the classroom.

If computer awareness activities are integrated into core subjects, evaluation may be in the core subject rather than in computer awareness. If computer awareness is a discrete subject, evaluation could be reflected under a separate subject heading.


MUSIC
MATHEMATICS
SOCIAL STUDIES
ART
SCIENCE
LANGUAGE ARTS

integration

INTEGRATION

Computer Awareness in grades 7-9 may be taught entirely as a discrete subject or it may be integrated with other junior high curricula. The 7-9 Computer Awareness Integration Chart was prepared by committee members to assist teachers wishing to develop an integrated thematic approach in the area of computers. Such an approach allows the content and concepts of a number of subject areas to be integrated with computer awareness.

The grade 7-9 Language Arts, Mathematics, Science, and Social Studies guides have been examined to determine which concepts and skills are taught at each level. The skills and concepts of the Computer Awareness activities were matched with those from the grade 7-9 guides in the form of the 7-9 Computer Awareness Integration Chart. Teachers who require a detailed explanation of the concepts or skills identified in the chart should refer to the appropriate subject area guide for clarification.

The 7-9 Computer Awareness Integration Chart is a matrix of the subject areas and the Computer Awareness activities identifying where integration can occur. Each activity is listed vertically along the left-hand side of the page according to code, title, and level.

The subject areas of Language Arts, Mathematics, Science, and Social Studies follow across the top. Where integration of a specific Computer Awareness activity might occur with a particular subject area, the concept or skill is identified in the matrix. For example, Activity II-5-1, Plotting Relative Sizes of Types of Computers, is an activity which can match with Mathematics in the area of graphing and which can match with Science in the area of classifying. The teacher can use such information to help plan an integrated lesson in Mathematics or Science.

Five special terms appear in the 7-9 Computer Awareness Integration Chart. The term "hands-on", abbreviated H-o, refers to the fact that students are required to use a computer to achieve the desired outcomes. The term "teacher utility", TU, means that particular activity has been provided to aid the teacher in demonstrating a concept for students. These utilities are not intended to be used directly by all students. The term "Logo", Lo, identifies those activities involving a graphics-based, problem-solving, computer language. Activities developed for use in teaching the BASIC language are designated BA. The term used to identify tool uses of computers is TO.

Frequently computer awareness is taught as a discrete subject in junior high school. Teachers using this approach should be prepared to promote computer use in other subject areas. The Tool Uses section (Unit IV), particularly word processing, provides a vehicle for integrating computer use with other subject areas.

7-9 COMPUTER AWARENESS INTEGRATION CHART

ACTIVITY	TITLE	LEVEL	LANGUAGE ARTS	MATHEMATICS	SCIENCE	SOCIAL STUDIES	OTHER
I-1-1	Diskette Do's and Don'ts	1					.teacher utility
I-4-1	"Keying In"	1,2,3					.teacher utility
II-1-1	Input, Processing, Output	1			.classifying		
II-3-1	Hardware Classification	2	.vocabulary development		.classifying		
II-3-2	"Amblescray"	2	.vocabulary .acronyms .spelling				
II-4-1	A Computer Model	3			.modelling		
II-4-2	The Simulated Computer	3	.role playing .following directions		.modelling		
II-5-1	Computer Comparisons	3		.graphing	.classifying		
II-8-1	Parlez-Vous Computer?	3			.classifying		
II-9-1	Connect the Binary Dots	2		.arithmetic operations			
II-9-2	Dot-to-Dot--Base 2	2		.arithmetic operations			

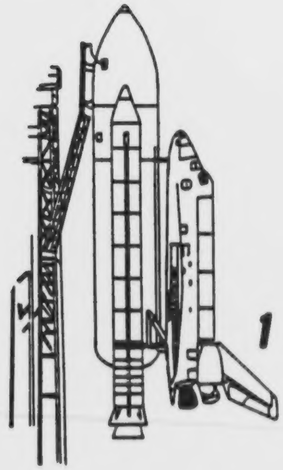
ACTIVITY	TITLE	LEVEL	LANGUAGE ARTS	MATHEMATICS	SCIENCE	SOCIAL STUDIES	OTHER
II-9-3	Coded Cartoon Captions	3		.problem solving			
II-9-4	Binary Mind Reading	3		.problem solving			
III-1-1	History Hunt	1	.vocabulary .spelling			.life in modern world	
III-2-1	Generation Gaps	2	.vocabulary .spelling			.life in modern world	
III-3-1	Speedy Computer	3					.teacher utility
III-3-2	Sorting Things Out	3					.teacher utility
III-3-3	10100 Questions	3	.communication .classification .analysis			.life in modern world	
IV-B1-1	Perplexing Parentheses	2		.order of operations			
IV-B4-1	Fascinating Flowcharting	1	.sequencing .analysis				
IV-B4-2	Sherlock Robot	2	.following directions				

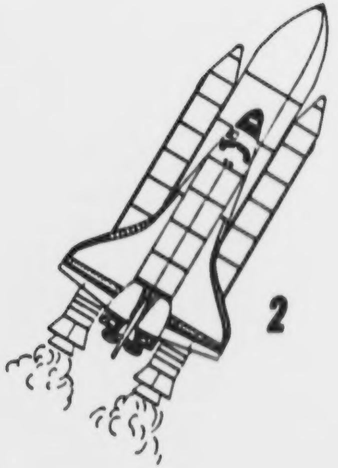
ACTIVITY	TITLE	LEVEL	LANGUAGE ARTS	MATHEMATICS	SCIENCE	SOCIAL STUDIES	OTHER
IV-B4-3	Mission Impossible	3	.sequencing .analysis				
IV-B5-1	PRINT Predictions	1					.hands-on
IV-B5-2	PRINT Predictions	1					.hands-on
IV-B5-3	Punctuation Predictions	1					.hands-on
IV-B5-4	Punctuation Problems	2					.hands-on
IV-B5-5	Loop the Loop	2					.hands-on
IV-B5-6	B-Loop-ers!!	2					.hands-on
IV-B6-1	Variables on a Theme	2					.hands-on
IV-B6-2	Using Variables	2					.hands-on
IV-B6-3	Loops II	2					.hands-on
IV-B6-4	... and FOR the NEXT Loop ...	3					.hands-on
IV-B6-5	Stringing Along	2					.hands-on
IV-B6-6	All Strung Out	3					.hands-on
IV-B6-7	I/O ... I/O	2					.hands-on
IV-B6-8	INPUT Problems	3					.hands-on

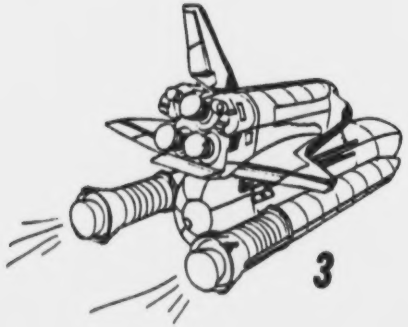
ACTIVITY	TITLE	LEVEL	LANGUAGE ARTS	MATHEMATICS	SCIENCE	SOCIAL STUDIES	OTHER
IV-B6-9	IFfy Programs	2					.hands-on
IV-B6-10	IFfy Problems	3					.hands-on
IV-B7-1	STEPping Out	3					.hands-on
IV-B7-2	STEP Problems	3					.hands-on
IV-B7-3	READing DATA	3					.hands-on
IV-B7-4	READing More DATA	3					.hands-on
IV-L2-1	Logo Log Book	1,2,3					.hands-on .Logo
IV-L3-1	Closed Shapes	1		.geometry			.hands-on .Logo
IV-L4-1	Procedure Planning	1,2,3					.hands-on .Logo
IV-T1-1	Martin's Mystery	1					.teacher utility
IV-T1-2	The A-Maze-ing Cursor	1					.teacher utility
IV-T1-3	Which Witch?	1					.teacher utility
IV-T1-4	Letter from Camp	1					.teacher utility

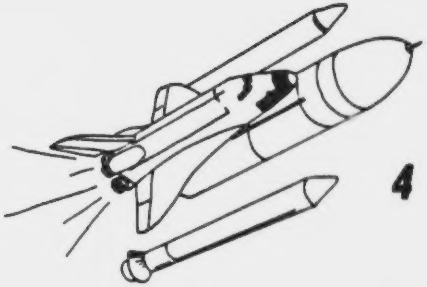
ACTIVITY	TITLE	LEVEL	LANGUAGE ARTS	MATHEMATICS	SCIENCE	SOCIAL STUDIES	OTHER
IV-T1-5	Last Will and Testament	1					.teacher utility
IV-T1-6	Who Dun It?	2					.hands-on .teacher utility
IV-T2-1	Constructing the Database	2					.teacher utility
IV-T2-2	Manipulating the Database	2					.teacher utility
IV-T2-3	Retrieving Information from the Database	2					.teacher utility
IV-T3-1	Getting to Know TOOLCALC	3					.hands-on
IV-T3-2	LOADing Your 'Plate'	3					.hands-on .teacher utility
IV-T3-3	Hidden Puzzle	3					.hands-on
IV-T3-4	Computer Labels	3					.hands-on
IV-T3-5	Cell Exploration	3					.hands-on
IV-T3-6	"What Mark Do I Need ..."	3					.hands-on
IV-T3-7	The Carpet Caper	3					.hands-on

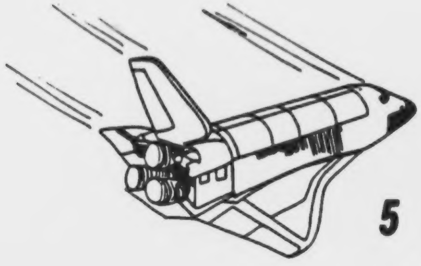
ACTIVITY	TITLE	LEVEL	LANGUAGE ARTS	MATHEMATICS	SCIENCE	SOCIAL STUDIES	OTHER
IV-T3-8	Building A House	3					.hands-on
V-2-1	Scavenger Hunt	1	.reporting				
V-6-1	Computers Can...Cannot...	2	.discussion				
V-6-2	Opinionnaire	3	.interviewing	.statistics .graphing	.collecting and interpreting data		


1

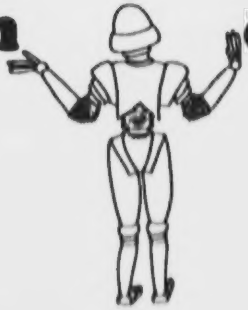

2


3


4


5

program outline



I. GETTING STARTED! 5%

This unit is designed to provide the student with the necessary skills for operation of a microcomputer including appropriate care and handling of the microcomputer system, using the keyboard, and loading software from cassette or diskette. This topic could be used to train students in the use of C.A.I. (Computer Assisted Instruction) programs and should probably precede Unit IV.

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
	Microcomputer-specific resources are identified using the following abbreviations: Apple - AP, Radio Shack - TRS, Commodore - PET or C-64. If no abbreviation is given, the resource may apply to a variety of microcomputers.	
The student should be able:		
1. to identify and to show how to care for the components of the microcomputer system; (Level 1-Proficiency)	Instruct students as to proper care and use of the components of the microcomputer system which include tapes, diskettes, cassette recorders, disk drives, printers, microcomputers, and monitors. It is recommended that the components of the microcomputer system be protected by dust covers when not in use. Guard diskettes against heat and cold extremes, bending, and contact with liquids, magnetism, dust, smoke particles, food, and static electricity.	I-1-1 TU
2. to explain the rules for the use of the microcomputer system; (Level 1-Proficiency)	If the microcomputer is portable then rules should be established in order to schedule its use efficiently. If the microcomputer is within a lab setting then rules for the lab should be established.	

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
	Some rules to be considered include: 1. No food or drink allowed in the microcomputer lab. 2. Use of microcomputers is by scheduled assignment only. 3. No game-playing allowed during school time. 4. Microcomputer systems must be turned off after use. 5. When students are working in pairs, only one student at a time uses the keyboard.	
3. to explain and to show how to switch on a microcomputer system; (Level 1-Proficiency)	It is recommended that teachers review the manuals which come with the microcomputer system before setting up the microcomputer and its peripherals. User's Guides for Apple II, Commodore PET and TRS-80 Model III microcomputers are available from the Educational Technology Program. It is recommended that each complete microcomputer system be plugged into a separate power bar equipped with an individual switch, indicator light, and fuse. The components should be plugged in such that the power supply to all components is controlled simultaneously by the power bar. This procedure will avoid mistakes in following the correct order for powering up the components of the microcomputer system.	
4. to demonstrate the use of all keys on the microcomputer keyboard in immediate mode; (Level 1-Introduction) (Level 2-Expansion) (Level 3-Expansion)	Immediate mode is accessed without the use of software through procedures that depend on the make and model of microcomputer. First turn on the microcomputer then follow the appropriate steps outlined below: APPLE II+, APPLE IIe, and APPLE IIc - hold down <CTRL/CONTROL> and press <RESET> - type HOME and press <RETURN> to clear the screen and move the cursor to the top left corner	

62

63

PET 2001, PET 4032, PET 8032, and C-64

- these microcomputers are automatically in immediate mode when turned on
- clear the screen by depressing the shifted <CLR/HOME>

TRS-80 III and TRS-80 IV

- wait for the disk drive light to go out
- hold down the BREAK key. While this key is being depressed press and release the orange RESET button
- when the prompt "Cass?" is displayed, press <ENTER>
- when the prompt "Memory Size?" is displayed, press <ENTER>
- when the prompt ">" is displayed, type CLS and press <ENTER> to clear the screen and move the cursor to the top left corner

SAMPLE KEYBOARD FAMILIARIZATION ACTIVITIES:

Students should be encouraged to gain familiarity with the various symbols on the keyboard of the microcomputer. Prior to actually writing computer programs, students should be encouraged to design various patterns on the screen using the cursor control keys. It is important that students DO NOT PRESS <RETURN> or <ENTER> during the following activities. In addition, each student should be familiar with the procedure for clearing the screen on the microcomputer being used, for example; type HOME (Apple), type CLS (Radio Shack) or press shifted <CLR/HOME> (Commodore).

I-4-1
TU

NOTE: On the TRS-80 microcomputer it may not be possible to move the cursor up in immediate mode. Students should plan their solutions in advance on graph paper and enter them from top to bottom. The right arrow key moves the cursor 8 spaces, the space bar moves one space at a time.

NOTE: On the Apple II microcomputer <ESC> is pressed immediately before pressing <I>, <J>, <K>, and <M> to move the cursor up left, right, and down, respectively. On the Apple IIe the arrow keys may be used for cursor movement.

Suggested activities include:

- "CENTRE STAGE" (AP, C-64, PET, TRS)

  Students begin by clearing the screen. Without pressing <RETURN>, move the cursor to the center of the screen and type an asterisk, *. Attempt to move the cursor back to the top left hand corner without erasing the asterisk.

- BASEBALL DIAMOND (AP, C-64, PET, TRS)

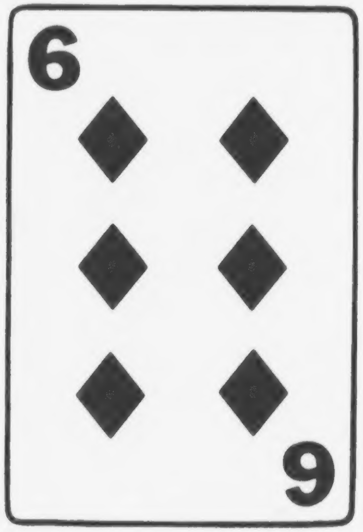
  Students are to design a baseball diamond which fills the microcomputer screen. Microcomputers with graphics symbols on their keyboard allow a number of choices for the symbols which make up the base lines and bases. Encourage students to be creative. Those who finish first might attempt to place the out-fielders, pitcher, catcher, and players at their various positions.

- DIAMOND RING (AP, C-64, PET, TRS)

Students should clear the screen and draw a ring or circle of characters near the center of the screen. As an extension, suggest that students design a diamond setting for the ring. The claws and setting could contain a solitaire, cluster of precious stones, eternity ring or any unique design. Some students may wish to position the flashing cursor over their diamond solitaire to give the illusion of brilliance. When completed, allow students to compare designs and show that there is more than one possible way to complete this task. Stress that, in programming as well, there are often many possible solutions to a problem.

- "SIX OF DIAMONDS" (AP, C-64, PET, TRS)

Students might be challenged to design, on the screen, the "six of diamonds" playing card as shown below.



* "TIC-TAC-TOE" (AP, C-64, PET)

If a tic-tac-toe (or X's and O's) nine square grid is drawn on a transparency, it can be placed over the microcomputer screen. Static electricity may keep the transparency in place or masking tape could be applied. Never place masking tape directly on the screen but rather tape it to the top of the monitor so the acetate can be flipped up out of the way when the grid is not required. Using the acetate grid, pairs of students can now play Tic-Tac-Toe by manipulating the cursor to place alternate X or O symbols.

* "FIFTEEN" (AP, C-64, PET)

The acetate grid designed for Activity #5 also can be used in this activity. Two players alternate placing the numbers 1, 2,3,4,5,6,7,8 and 9, using only cursor controls, in the nine grid squares. The student with the odd numbers (1,3,5,7, or 9) must position one of these numbers first. The opponent using the even numbers (2,4,6, or 8) places one of these numbers using cursor controls in such a manner that a line of three boxes (horizontal, vertical or diagonal) totals fifteen. Players alternate taking turns and the player who completes a diagonal, horizontal, or vertical line whose sum totals "fifteen" wins. After each game the students should switch roles so that each person gets an opportunity to start first and to use the odd numbers.

* "SCRABBLE" (AP, C-64, PET)

Pairs of students can use the microcomputer screen to play a "Scrabble-like" game. One student should begin by clearing the screen and printing the word MICROCOMPUTER horizontally across the middle of the screen. The second student, using cursor controls, must enter any word which intersects the word MICROCOMPUTER vertically. Players alternate positioning words in an intersecting fashion to gain practice and familiarity with the use of cursor control keys. If players adopt a rule restricting the words to scientific terms, or literacy terms, then the resulting scrabble could be printed out and used as the basis for a word search activity for other students.

* "A MAZE-ING" (AP, C-64, PET)

Provide each student with a blank transparency on which to design a maze to challenge the cursor control ability of fellow classmates. The maze drawn on the transparency is taped over the monitor or television screen. Students can then use the cursor keys to move the cursor through the maze without running into any walls. Don't worry that there is no software to provide an alarm noise when the cursor "hits" a barrier since the partners at the microcomputer generally will provide more than enough verbal feedback when the student controlling the cursor runs into a wall. Students may wish to challenge each other to see who can negotiate the maze successfully in the shortest time. Students who "crash" into a wall of the maze must end their turn.

* MAPS (AP, C-64, PET)

Teachers may wish to use a microcomputer and cursor controls to foster map reading skills. For example, if a transparency of the map of Canada is positioned over the microcomputer screen, students can move their cursor over such routes as:

(a) the fur trade waterways from Lake Superior to the Red River.

(b) a trip across Canada passing through each provincial capital city.

(c) the Great Lakes system from Thunder Bay to the Atlantic Ocean.

(d) the Canadian/American border from the Atlantic Ocean to the Pacific Ocean.

(e) the North-West Passage through the Canadian Arctic.

(f) The Alaska Highway from Fairbanks to Edmonton.

* "TRAINING TO BE A MICROCOMPUTER OPERATOR" (AP, C-64, PET, TRS)

Students using microcomputers which have an insert and delete function on the keyboard should experiment with these procedures. One might begin by clearing the screen and typing in the word "ENGINEER". Delete the ER characters to create the word "ENGINE". Enter one space following the word "ENGINE" and type in the word "CABOOSE". Use the insert function to place the word TENDER" between the words "ENGINE" and "CABOOSE".

Once you are successful, enter other freight cars such as "BOXCAR", "GONDOLA" and "TANKER" between the "TENDER" and the "CABOOSE". Using cursor controls, replace each space between the respective cars with equal signs (=) to represent the couplings and place the (0) symbol on the next line under the first and last letters of each "car" to represent wheels. The finished "train" might be similar to the following:

```
ENGINE=TENDER=BOXCAR=GONDOLA=TANKER=CABOOSE
0    0 0    0 0    0 0     0 0    0 0     0
```

* "ASTEROIDS" (AP, C-64, PET)

Pairs of students can work at this space-age game. One student randomly enters a series of asterisks (which represent asteroids) over the screen. The partner must guide the cursor through the asteroid belt from one side of the screen to the other. Teachers should advise students to limit the number of asteroids to a specific number based on the number of characters which can be displayed on their microcomputer screen.

* "MORE MAZES" (AP, C-64, PET)

This activity is an extension of the mazes which were designed in Activity #8. Rather than having students draw mazes on transparencies, have pairs of students design simple mazes on the screen using immediate mode. Students should be encouraged to use the full range of graphics characters on their keyboards to draw the maze.

All microcomputers can use "-" for horizontal walls and "I" for vertical walls. Teachers should have students plan and draw each maze on graph paper before attempting to transfer it to the screen. Once the members of the team have entered and tested the maze on the microcomputer screen, allow them to switch microcomputers with another team (if possible). In order to stimulate creativity, the teacher could ask the following questions: "Can you draw a PAC-Man-like maze?", "Which symbol(s) could be displayed on the screen to represent a monster?" or "Is this maze similar to the one in 'Dungeons and Dragons'?."

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES

* POETRY (AP, C-64, PET, TRS)

Students can practice typing skills by creating short poems on the microcomputer screen. Verses of the traditional "Roses are red/Violets are blue...." type, or limericks are usually short enough to fit on the screen. Remember, to avoid the "SYNTAX ERROR" message, do not press <RETURN> or <ENTER> as the poem is typed line by line.

Examples:

Roses are red,
Violets are blue,
Computers process information
Faster than you!

There once was a lonely young suitor
Who searched for a mate by computer
But the grades weren't so great,
So, instead of a mate
The computer sent this suitor a tutor!

Students who complete poems or limericks quickly should be encouraged to format their creations by indenting the second and fourth lines of the poem and the third and fourth lines of the limerick.

5. to LOAD and to RUN computer software from diskette or cassette;
   (Level 1-Introduction)
   (Level 2-Proficiency)

The teacher should ensure that the computer software chosen to meet this objective is suitable, interesting and error-free. In order to facilitate the keyboarding activities suggested in Unit I, Objective 6 which follows, the teacher might combine these two objectives by loading and using appropriate keyboarding software.

Listed below are the loading instructions for various models of microcomputers. The teacher may wish to introduce the following commands as appropriate; LOAD, RUN, LIST, NEW, SAVE, VERIFY.

Steps for "Booting" an APPLE Microcomputer

1. Ground yourself.
2. Turn on the monitor.
3. Insert the diskette face up into the slot in the disk drive.
4. Close the door of the disk drive.
5. Turn on the power switch at the back of the microcomputer.
6. Wait until the red light on the front of the disk drive goes off for the first time.
7. Now make your program selection from the menu on the screen.

MENU-DRIVEN software automatically handles the cataloguing, loading, and running procedures and produces a "menu" from which program selections are made.

Note: When turning the Apple off, check to see that the red light on the disk drive is off, remove the diskette, turn off the computer, and then the monitor.

The following steps are necessary only if the software is NOT menu-driven.

8. Type the word CATALOG. Press <RETURN>.
9. The catalog or menu will appear on the screen.
10. Type LOAD and the name of the program you wish to run. Press <RETURN>.
11. Type RUN. Press <RETURN>.

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES

Steps for "Booting" a PET Microcomputer

1. Ground yourself.
2. Turn on the PET microcomputer.
3. Turn on the disk drive and wait for the indicator light to go out.
4. Insert the diskette face up into the slot in disk drive number zero.
5. Close the door of the disk drive.
6. Press <SHIFT> and <RUN/STOP> at the same time.
7. Now make your program selection from the menu on the screen.

MENU-DRIVEN software automatically handles the cataloguing, loading, and running procedures and produces a "menu" from which program selections are made.

When turning the PET microcomputer system "off," the preceding steps should be followed in reverse, starting at number five, otherwise damage may result to the software or the hardware.

The following steps are necessary only if the software is NOT menu-driven.

8. Press <RUN/STOP>.
9. Type CATALOG and press <RETURN>.
10. Select the program you wish to use. Note the exact spelling of its title.
11. Type LOAD "name of the program", 8 and press <RETURN>.
12. Wait until the word READY appears and the blinking cursor returns.
13. Type RUN and press <RETURN>.

83

82

Steps for "Booting" a TRS-80 Microcomputer

1. Ground yourself.
2. Turn on the power switch under the right side of the keyboard.
3. Wait until the red light on the disk drive goes off.
4. Insert the diskette face up into the slot in the bottom disk drive.
5. Close the door of the disk drive and press the orange (RESET) button.
6. Wait until the red light on the disk drive goes off and then press the orange (RESET) button again.
7. Now make your program selection from the menu on the screen.

MENU-DRIVEN software automatically handles the cataloguing, loading, and running procedures and produces a "menu" from which program selections are made.

Note: To turn off the TRS-80, check to see that the red light on the disk drive is off, remove the disk, and turn off the computer.

The following steps are necessary only if the software is NOT menu-driven.

8. When you see the words "TRSDOS READY" on the screen, type DIR and press <ENTER>.
9. Select the program you wish to use. Note the exact spelling of its title.
10. Type RUN "name of the program" and press <ENTER>.

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES

The teacher should be aware of the following sources of potential problems, and should introduce the appropriate trouble-shooting techniques to overcome these problems as required:

- The monitor must be properly connected to the microcomputer.
- The CONTRAST and/or BRIGHTNESS on the monitor must be properly adjusted.
- The cassette recorder or disk drive must be properly connected to the microcomputer.
- On the TRS-80 the cassette recorder volume must remain at one setting (see manual).
- The components of the microcomputer system such as disk drive, cassette recorder, printer, etc. must never be connected or disconnected while the power is on.
- Disk drives should be situated as far as possible from a colour monitor.

6. to be aware of proper keyboarding techniques.
(Level 1-Introduction)
(Level 2-Expansion)
(Level 3-Expansion)

Teachers should NOT expect students to be proficient in keyboarding skills but rather to be aware that there are proper techniques for the efficient use of the keyboard.

Teachers are encouraged to instruct students in proper keyboarding techniques. Emphasis should be placed on using both hands, positioning fingers on the "home row" keys, and watching the screen or paper instead of the keyboard while typing.

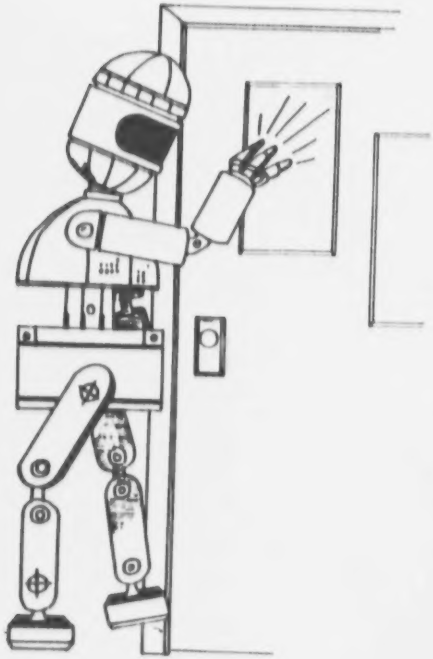
Students should be encouraged to use proper keyboarding techniques rather than the "hunt and peck" method. The following activities may be used:

* learn to locate keys and to use proper fingering on a paper keyboard.

- practice proper fingering on manual or electric typewriters using typing drills.

- develop speed on the microcomputer keyboard through the use of typing drill software.

Business Education teachers may be able to suggest resources. Where there is limited access to computers, teachers of computer awareness may be able to use a Business Education area to get access to keyboards for a few lessons. Other than <RETURN> or <ENTER> and a few other special function keys on the microcomputer, the keyboard arrangement on a typewriter and on a microcomputer are the same.



II. WHAT IS A COMPUTER? 15%

The purpose of this unit is to provide the student with information about the parts of a computer system--the computer itself and the peripheral devices which may be used with it. In addition, students will recognize that computers operate only through instructions provided by operators and that various computer languages are available for this interaction. Much of this topic involves presentation and use of new vocabulary relevant to these topics.

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
The student should be able:		
1. to interpret the operation of everyday activities in terms of the input-processing-output cycle; (Level 1-Proficiency)	As an analogy to computer operation, the class should examine the input-processing-output cycle of everyday activities. For example, kernels of popcorn are input to a popper, processed with oil in the hot corn popper, and are output as popcorn. In the same way, information is input into a computer, processed, and output to the user.	
	Teachers could distribute Activity II-1-1 and discuss with students how a computer operates using the input-processing-output cycle.	II-1-1 Sc
2. to relate the major parts of a computer to the input-processing-output cycle and to describe the operation of these parts; (Level 1-Introduction) (Level 2-Expansion) (Level 3-Expansion)	Teachers should introduce the three parts of a computer by relating these to the input-processing-output cycle and should encourage students to give examples of each. The three major parts of the computer and how they operate are described below:	
	1) INPUT DEVICE Data and instructions (program) are entered into the central processing unit using an input device. Examples of input devices are keyboard, cassette recorder, disk drive, modem, game paddle(s), joystick, mouse, graphics tablet, and light pen.	

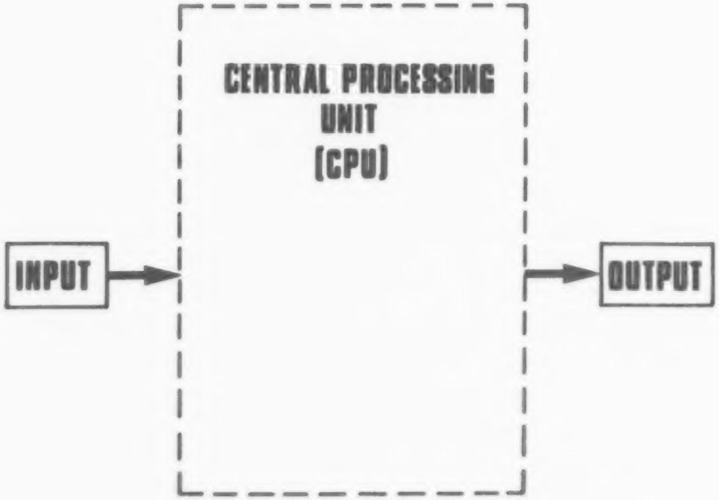
2) CENTRAL PROCESSING UNIT (CPU)

The Central Processing Unit (CPU) stores the instructions obtained from an input device, interprets the meaning of those instructions, performs mathematical operations, makes decisions, stores all data, and passes the results to an output device.

3) OUTPUT DEVICE

Processed information passes from the central processing unit (CPU) to the user through an output device. Examples of output devices are monitor, printer, disk drive, cassette recorder, robot, and modem.

BASIC PARTS OF A COMPUTER



OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
3. to identify and to describe the use of different types of input and/or output devices; (Level 2-Introduction) (Level 3-Expansion)	Encourage students to list examples of input and/or output devices. The following lists are not exhaustive: A. INPUT DEVICES keyboard card reader joystick/game paddle light pen graphics tablet mouse voice recognition device magnetic ink character recognition device optical scanner B. INPUT/OUTPUT DEVICES disk drive cassette recorder modem other computers C. OUTPUT DEVICES printer monitor speech synthesizer plotter robot	II-3-1 LA/Sc

The following definitions are provided for the convenience of the teacher. It is not intended that students memorize these definitions.

A. INPUT DEVICES

Keyboard - an input device which allows the user to type data directly into the computer.

Card Reader - an input device which reads information stored as pencil marks or punched holes on cards and inputs the information to the computer.

Joystick/Game Paddle - an input device usually used for video games. By moving a ball or lever, the user controls movement of a character on the screen.

Light Pen - a pen-like input device which allows the user to produce images directly on the screen by light simulation.

Graphics Tablet - an electronic drawing pad which inputs to the screen the lines traced by a stylus on the pad.

Mouse - a "trackball" device which inputs movement from any flat surface to the screen.

Voice Recognition Device - a device which changes voice patterns to computer impulses for analysis by computer.

Magnetic Ink Character Recognition (MICR) Device - a device which reads magnetic ink patterns (price tags, cheques, etc.) and passes the data to the computer.

Optical Scanner - a device which reads Universal Product Code (UPC) symbols from grocery items.

B. INPUT/OUTPUT DEVICES

Disk Drive - an input device which reads magnetically stored data from a diskette into the computer.

- an output device which records computer output magnetically onto diskette.

Cassette Recorder - an input device which reads magnetically stored data from cassette tape into the computer.

- an output device which records computer output magnetically onto cassette tape.

Modem - an input/output device which changes computer signals to telephone signals and vice-versa to allow one computer to send information to another via telephone.

Other Computers - computers may be linked as either input or output devices to exchange information.

C. OUTPUT DEVICES

Printer - an output device which provides a typed copy (hard copy) of computer output.

Monitor (Cathode Ray Tube or CRT, screen, T.V.) - television-like screen which displays computer output.

Speech Synthesizer - an output device which produces sounds closely resembling human speech.

Plotter - an output device with a full range of horizontal and vertical movement allowing production of line drawings and graphics.

Robot - a mechanical output device which is controlled by computer.

Students could research magazines, product catalogues, and newspapers for pictures of input and/or output devices. These pictures may be displayed in media notebooks, on bulletin boards, as posters, or as collages.

Word scrambles or word find activities are challenging ways of reviewing the names of the devices. In addition, the teacher might start a computer parts collection or show filmstrips depicting these devices.

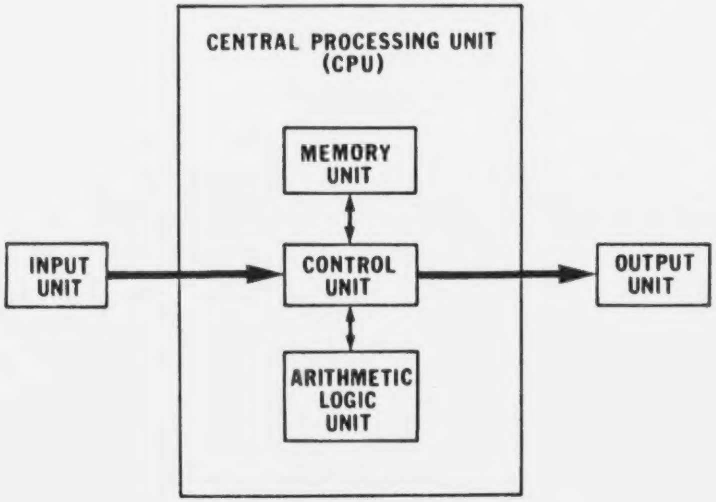
II-3-2
LA

Resource:

1. Computer Parts Kit
   - "MECC Computer Parts Kit" by Minnesota Educational Computing Corporation, 3490 Lexington Avenue, St. Paul, MN 55112.

4. to describe the interrelationships between the parts of the central processing unit;
(Level 3-Introduction)

The Central Processing Unit (CPU) is made up of the control, memory and arithmetic/logic units. The following model represents the interrelationships between the parts of the central processing unit.


CENTRAL PROCESSING UNIT
(CPU)
MEMORY UNIT
INPUT UNIT
CONTROL UNIT
OUTPUT UNIT
ARITHMETIC LOGIC UNIT

NOTES AND EXPLANATIONS	ACTIVITIES
Have students label the parts of a computer using the diagram of a computer model provided in Activity II-4-1.	II-4-1 Sc
To aid students in clarifying their understanding of the interrelationships between the parts of the central processing unit, have the students role play the parts of a computer as outlined in Activity II-4-2. In this activity, the students act out the steps in the solution of a simple arithmetic problem (e.g., 2 + 3) by simulating the steps that a computer would have to perform.	II-4-2 LA/Sc

The following resources are very helpful in developing an understanding of the interrelationship between the parts of a computer:

Resources:

1. Computer Rage Game, available from CREATIVE COMPUTING, P. O. Box 789-M, Morristown, NJ 07960
2. "Simulated Computer" Apple diskette (A-Q4), Stekettee Educational Software, 4639 Spruce Street, Philadelphia, PA 19193 (AP)
3. "The Three R's of Microcomputing" - MECC diskette #A-811 includes a simulation entitled the "Glass Computer " for use on Apple microcomputers.

5. to compare the memory capacity, physical size, and cost of mainframe computers, minicomputers, and microcomputers; (Level 3-Introduction)

The three general types of computers are the microcomputer, the minicomputer, and the mainframe computer. The students should compare memory capacity, physical size, and price for these three types of computers. Although the definition of these terms is changing, the following relationships are suggested:

	Memory	Size	Price
Microcomputer	4K-512K	desk top	$100+
Minicomputer	Up to 2 000K	phone booth	$20 000+
Mainframe computer	Up to 16 000K	room size	$1 000 000+

II-5-1
Ma/Sc

The units used to describe the memory capacity of computers refers to a kilobyte (K) which is 1024 characters. (A double-spaced typewritten 8½" x 11" page contains approximately 2K.)

While most students can visualize the relative physical size differences of the three types of computers (e.g., desk top, phone booth, room size), they may have difficulty visualizing the relative differences in computer power and cost. Activity II-5-1 will help the student visualize the relative differences among the three types of computers while comparing their relative cost.

* The class, groups of students, or individual students could visit local computer vendors or computer users to obtain updated and more detailed information concerning these three types of computers.

6. to identify similarities and differences among computers, calculators, and electronic games; (Level 1-Introduction) (Level 2-Expansion)

Teachers could have students bring hand-held calculators or electronic games such as Little Professor, Dataman, Simon, Big Trak, Merlin, Head-to-Head Sports Games, or Pacman. The students could discuss the similarities and the differences between these devices and a computer.

SIMILARITIES	DIFFERENCES
. both contain microchips . both accept input . both provide output . both process information . both require a power supply	. computers are more expensive . computers have a larger memory capacity . computers are usually physically larger . computers have many uses whereas electronic games and calculators are designed for a specific purpose . computers can connect to various peripheral devices

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
7. to identify different types of microcomputer data storage media; (Level 3-Introduction)	Microcomputer data storage exists in both external and internal forms. External storage refers to the storage of data on cassettes, diskettes or hard disk. Internal storage refers to the storage of data in the RAM and the ROM microchips. Data stored in RAM (Random Access Memory) is changeable. For example, a student program is contained in RAM and can be changed. Turning a computer off clears the RAM. Data stored in ROM (Read Only Memory) is permanent and unchangeable and remains in the computer even when it is turned off. For example, the BASIC programming syntax is contained in ROM and never changes. RAM and ROM could be described to students by the following analogy: RAM is like a notebook in which students can write, modify, and delete information whereas ROM is like an encyclopedia which contains information which students can access but not alter.	
8. to recognize that a computer follows instructions from a program written by a person using a programming language; (Level 2-Introduction) (Level 3-Expansion)	Level 2 students simply should be aware that people write programs using many different computer programming languages. Level 3 students should be able to name several computer languages and to state their prime uses. Some computer languages include: BASIC (Beginner's All Purpose Symbolic Instructional Code) - used in most microcomputers. FORTRAN (FORmula TRANslation) - used for scientific applications. COBOL (COmmon Business Oriented Language) - used for business. Logo - a graphics oriented list processing language used in education PILOT - an authoring language used by novices to make program-writing easier Pascal - used by computer scientists Machine Language - a language based on binary numbers and used by computers	II-8-1 Sc

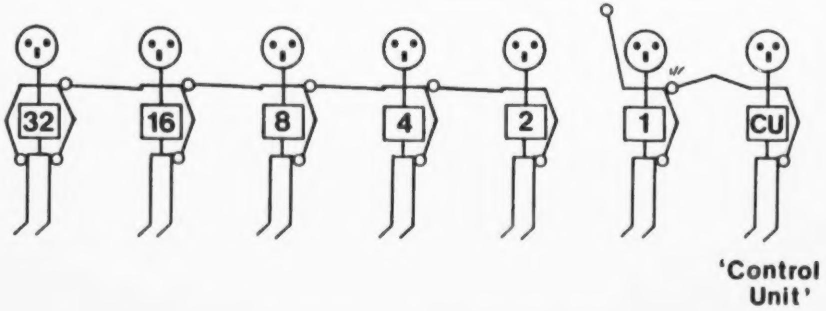
9. to translate between base ten and binary numbers. (Level 2-Introduction) (Level 3-Expansion)

The teacher could point out that computers function using binary numbers because only two digits, 0 and 1, can be represented by the OFF or the ON state of the electronic switches in the computer. All ten digits of the decimal system cannot be represented in this way, therefore, translation between decimal and binary notation is required.

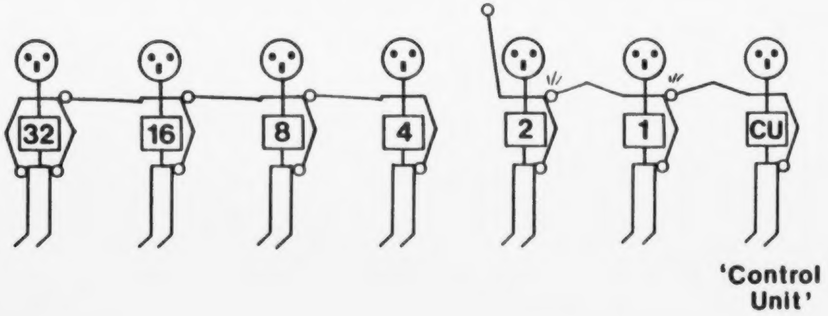
The various high-level computer programming languages such as BASIC, COBOL, FORTRAN, Logo, and Pascal have interpreters or compilers which translate English-like statements into a binary code.

The following demonstration simulates the method by which a computer memory unit uses binary arithmetic to store data.

- Have six students stand side by side in a straight line facing the class.
- The student on the right side of the line should wear a card with the "ones" place value, the next student should wear a card with the "twos" place value, and so on as in the illustration which follows.
- Each student should extend his/her right arm so that his/her right hand rests on the next student's left shoulder.
- Each student represents a 'switch' which will be changed when he/she receives an impulse from the student on his/her left.
- Each student must raise his/her right arm when his/her left shoulder is tapped and lower it again when his/her shoulder is tapped the next time.
- Every time an arm is lowered, it passes the 'impulse' to the next student's shoulder.
- Another student weraing a card labelled CU will act as the 'control unit' to enter numbers into the memory by tapping the shoulder of student #1 the appropriate number of times.

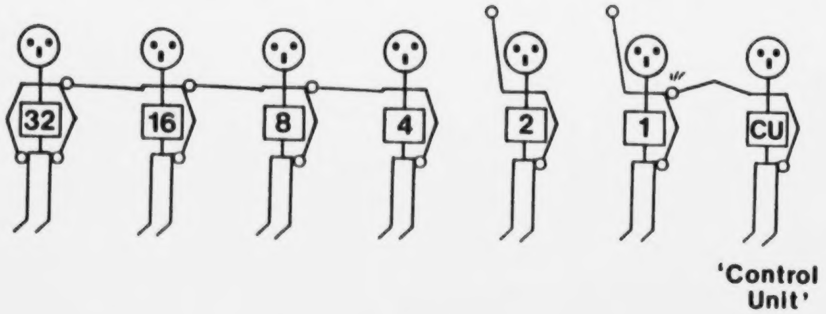

32
16
8
4
2
1
CU
'Control Unit'

position
after 1
tap
1 in decimal notation is
equivalent to 000001 in
binary notation


32
16
8
4
2
1
CU
'Control Unit'

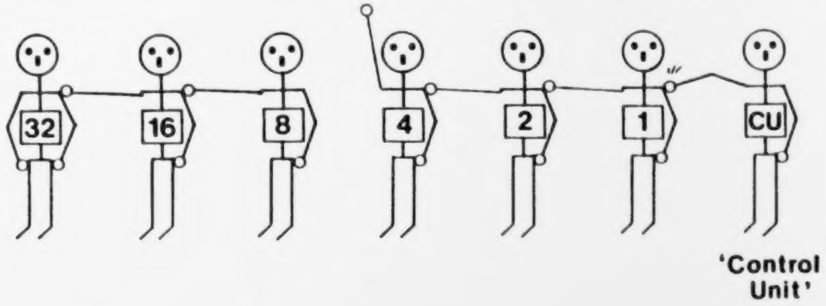
position
after 2
taps
2 = 000010

112


32
16
8
4
2
1
CU
'Control Unit'

position
after 3
taps
3 = 000011

113



position
after 4
taps
4 = 000100

* As an extension, this simulation can be used to illlustrate simple binary addition. For example, 7 + 3 = 001010.

Activities II-9-1 to II-9-4 provide experience in binary coding and decoding. In addition, these activities reinforce the idea that every keyboard character has an equivalent binary code.

II-9-1
Ma
II-9-2
Ma
II-9-3
Ma
II-9-4
Ma

III. HOW COMPUTERS HAVE DEVELOPED 10%

This unit provides students with a background to the development of computing aids from early times to present day. Students should be aware of the gradual technological development of computers through the years. Emphasis is to be placed on the trends associated with this development.

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
The student should be able:		
1. to recognize significant developments which contributed to the evolution of the modern electronic computer; (Level 1-Introduction) (Level 2-Expansion)	The teacher should keep in mind the limited time available for this unit and treat this section accordingly. Do not attempt a rigid formal presentation with emphasis on memorization of names and dates. Instead, plan a research approach using some of the suggestions given below.	III-1-1 LA/SS
	The following historical sketches are for the teacher's information:	
	finger calculators - finger math is still used in some parts of the world	
	abacus - 2000 B.C. - an oriental calculating device which consists of counter beads on a frame. It is still in use in some areas.	
	Stonehenge - 1800 B.C. - one of the world's most famous prehistoric constructions for tracing solar and lunar cycles.	
	Napier's Bones - 1640 A.D. - John Napier developed a series of wooden rods each carrying multiples of 1, 2, 3, etc. These rods were chosen and aligned appropriately to faciliate long multiplications.	
	first mechanical calculating machine - 1647 A.D. - Blaise Pascal - a complex combination of gear wheels which successfully performed addition and subtraction.	

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES

Jacquard's loom - 1775 - Joseph Marie Jacquard - this loom made use of a belt of punched cards which had patterns of holes to set the warp threads in weaving so that fabric patterns were automatically created. This was the first use of punched cards to store information.

difference engine - 1812 - Charles Babbage - a mechanical calculating machine using cog wheels which was used to generate various mathematical and navigational tables.

analytical engine - 1833 - Charles Babbage - this planned mechanical calculating device possessed input/output capabilities, a control unit, a memory, and a logic unit -- all the components of the modern computer. The huge steam driven machine never was successfully operated.

programming - early 1800's - Lady Ada Lovelace, the daughter of Lord Byron, was an accomplished mathematician who worked with Babbage in the development of programming concepts for the analytical engine. She is considered the first programmer.

cash register - 1878 - James Ritty.

recording adding machine - 1880 - Wm. S. Burroughs - first adding machine which recorded entries and running totals on paper.

electronic sorter - 1880 - Herman Hollerith - improved upon the punched card system by using electrical contacts to sense holes in the cards, thus providing a sorting method which was used to facilitate tabulation of the 1880 U.S. census data.

differential analyzer - 1930 - Vanevar Bush - a huge machine consisting of pulleys, gears, differentials, and motors which was used to generate artillery firing tables.

Mark I - 1944 - Howard Aiken - began work on the Automatic Sequence-Controlled Calculator which consisted of 78 adding machines and desk calculators controlled by a roll of punched paper. With 800 kilometres of wires connecting its relays and switches this electro-mechanical computer called MARK I began operation in 1944. It became obsolete fifteen years later.

ENIAC (Electronic Numerical Integrator and Calculator) - 1946 - John Mauchly and J. Presper Eckert - one of the first electronic computers - contained 18 000 vacuum tubes and weighed 30 tonnes - drew 130 000 watts of electricity and it is claimed that all the lights in West Philadelphia used to dim when ENIAC was turned on.

EDSAC (Electronic Delay Storage Automatic Calculator) - 1949 - Maurice Wilks, Cambridge University in England, EDSAC used the binary process which eventually increased computer speeds.

stored program - John von Neumann introduced a significant development which allowed a computer program to be stored inside the computer while the central processor worked on it without operator intervention.

compiler program - Captain Grace M. Hopper created the first compiler program which translated high level instructions into binary so that the computer could operate on them. This technique also was used to provide the programmer with feedback in the form of error messages when the instructions were wrong. Captain Hopper was a U.S. Navy officer who worked on the Mark I computer in 1943.

UNIVAC I (UNIVersal Automatic Computer) - 1951 - was the first commercially available computer which was installed at the United States Bureau of Census.

Suggested activities include:

- Students could conduct research about the abacus to determine:
  - country of origin,
  - where it continues to be used,
  - the value of the beads,
  - how it is operated.
- Students could construct an abacus with rods and beads or any other suitable materials.
- Students could demonstrate how an abacus is used to perform simple calculations.
- Students could produce a set of Napier's Bones and use them to perform simple multiplication or division.
- Students could research the life and contributions of:
  - John Napier
  - Blaise Pascal
  - Joseph Marie Jacquard
  - Charles P. Babbage
  - James Ritty
  - William S. Burroughs
  - Herman Hollerith
  - James Powers
  - Howard Aiken
- Students could develop a historical timeline or mural either individually, in groups, or as a class project.

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
2. to list and to discuss the characteristics of the four generations of computers; (Level 2-Introduction) (Level 3-Expansion)	The development of the modern computer traditionally has been classified into four "generations." Although no strict definitions exist for each, the following guidelines are suggested: . First Generation of Computers (1950-1959) a) based upon vacuum tube design b) gigantic size relative to performance capabilities c) speeds were measured in the millisecond range d) developed enormous amounts of heat; required large air conditioning units e) consumed a great deal of electrical energy f) notoriously unreliable g) programmed in machine language . Second Generation of Computers (1960-1965) a) based upon transistor design b) physically smaller than predecessors c) speeds were measured in the microsecond range d) used a magnetic core for storage e) larger storage capacity which permitted the use of more input and output devices f) programming was done in symbolic languages . Third Generation of Computers (1965-1975) a) based upon solid state technology, or integrated circuit design b) speeds were measured in the nanosecond range c) consumed considerably less electrical energy d) cooler operating e) main storage technology changed; core replaced by plated wire, thin film, and monolithic storage f) multi-processing (several programs executing simultaneously)	III-2-1 LA/SS

- g) on-line system made possible the accessing of the computer from remote locations
- h) computer languages improved; more sophisticated for the professional, more simplified for the casual user

. Fourth Generation of Computers (1975 -)
- a) based upon microelectric technology, or microchip design
- b) places into hardware what formerly was in program code in software
- c) has performance improvements of several orders of magnitude
- d) allows main storage to be expanded to millions of characters by utilizing direct access storage as an extension of main storage
- e) allowed for the development of mini and micro computers
- f) has made computers and software available at low cost
- g) development of Silicon Valley

Suggested activities:

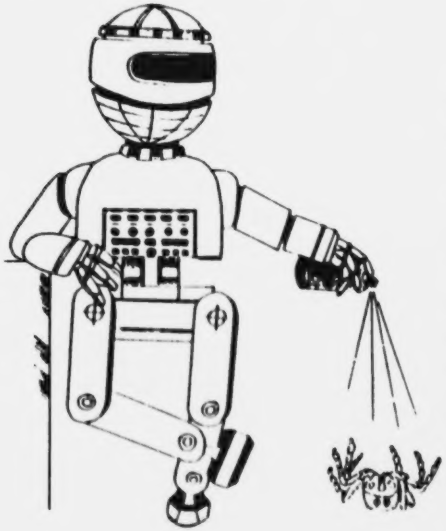
* The students could investigate the development of the solid state transistor at the Bell Telephone Labs in 1947 by John Bardeen, William Shockley and Walter Brattain. Students could then state the advantages of the solid stage transistor (second generation) over the vacuum tube (first generation). For example, the solid stage transistor consumed less power, generated less heat, had improved reliability, improved speed, and was physically smaller.

* The students could investigate the development of the integrated circuit in the mid 1960's and state the advantages of the integrated circuit (third generation) over the solid state transistor (second generation). For example, the integrated circuit contains many components fused together in a single process, is very reliable and is inexpensive.

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
	* In order to illustrate the concept of nanosecond, teachers may wish to show their class a 30 cm piece of wire, a "symbolic nanosecond", and explain that the propagation delay, or the time it takes for an electrical current to pass along the length of the wire, is approximately one nanosecond (one-billionth of a second). * Students could investigate the development of the microchip in the early 1970's and state the advantages of the microchip (fourth generation) over the integrated circuit (third generation). For example, the microchip incorporated further refinements such as semiconductor memories, very large scale integration, and virtual-storage techniques. * Students could investigate the development of computer software from machine language through high-level languages such as BASIC, FORTRAN, and Logo to tool software such as word processors, database management systems and electronic spreadsheets.	
3. to become increasingly aware of the trends in computer development. (Level 3-Introduction)	The teacher could explain that computers are growing smaller in size, larger in capacity, cheaper in cost, and faster in processing speed. These trends can be depicted using charts, graphs and photographs showing the relative size of different computers from the past and the present. If possible, the teacher or students could bring vacuum tubes, transistors, diodes, integrated circuits and microchips to illustrate the trend to miniaturization. Suggested activities: * In order to develop an appreciation of the concept of the size of a million, a billion, etc., students could calculate the number of seconds (or minutes) for a year, 10 years, or a century.	III-3-1 TU III-3-2 TU

- * The students could remove the outer cover from a surplus microchip in order to examine the large scale integration of the actual microchip under a microscope.

- * Students could research outstanding contributions in the field of computing.



As a review of the development of computers from the abacus to the present, the teacher could conduct a discussion with students in which they identify key people and/or key devices. As a group, the students should organize these items along a timeline. The students should decide which are the most important items on the timeline. These items should be highlighted. A blank card (approximately 5" x 8") should be given to each student. Students choose or are assigned one of the highlighted items which they print in large block letters on their card. The teacher collects and shuffles the cards. To begin the activity, the teacher attaches one card to the back of each student. The object of the activity is for each student to identify who or what they "are." Students may ask a maximum of one yes/no question of each classmate.

III-3-3
LA/SS

The teacher should reproduce the "WHO/WHAT AM I" in Activity III-3-3 and distribute one to each student. Each student carries this record sheet on which is to be recorded each question he/she asks, the response received (YES or NO), and the initials of the classmate who answered the question. After all students have determined their "secret identity," the teacher could lead a discussion to list the kinds of questions the students asked, to identify successful questioning strategies and to analyze various approaches in terms of efficiency or accuracy in solving the problem.

IV. HOW TO MAKE COMPUTERS WORK FOR YOU 50%

This unit is designed to provide students with "hands-on" computer experience. The unit is divided into three sections; namely, BASIC, Logo and Tool Uses. A choice must be made from these three sections:

- BASIC Section. Students are to recognize the function, to predict the output, and to construct simple programs applying specified constructs using the BASIC programming language. Emphasis is to be placed on problem solving. Refer to page 69.

  OR

- Logo Section. Students could continue with or be introduced to a full version of Logo. Emphasis is to be placed on top-down problem solving involving repetition, recursion, variables, coordinate geometry and list processing. Refer to page 90.

  OR

- Tool Uses Section. Students are to be exposed to three personal productivity tools; namely, word processing, database management and electronic spreadsheet analysis. Refer to page 122.

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
BASIC		
The student should be able:		
B1. to demonstrate the use of the microcomputer as a calculator; (Level 1-Introduction) (Level 2-Expansion)	The computer may be used as a calculator using the PRINT command before the numerical expression to be calculated and pressing <RETURN/ENTER> after it. For example, PRINT 3+4 (press <RETURN/ENTER>) or ?3+4 (press <RETURN/ENTER>). The computer uses the asterisk * for multiplication sign, / for division sign, and the up arrow (↑) for exponents (Λ with Apple). The computer performs arithmetic computations according to the mathematical order of operation rules proceeding as follows:	IV-B1-1 Ma

1. brackets
2. powers or exponentiation
3. multiplication or division from left to right
4. addition or subtraction from left to right

B2. to demonstrate the use of all keys on the microcomputer keyboard in programming mode;
(Level 1-Introduction)
(Level 2-Expansion)
(Level 3-Expansion)

See Unit I, Objective 4.

Students should be encouraged to use proper keyboarding techniques.

Teachers who are using this guide sequentially may have demonstrated the use of various keys on the microcomputer, and may have familiarized students with the proper keyboarding technique. If, on the other hand, a teacher has chosen to begin Unit IV prior to exploring the concepts in Unit I, Objectives 4 and 6, it is recommended that students become familiar with the functions of the various keys and proper keyboarding techniques.

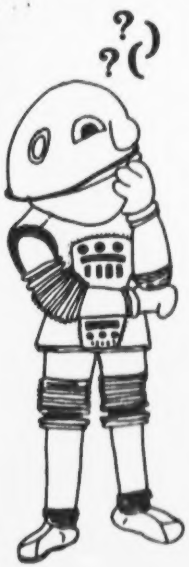
In Unit I, many of the activities were conducted in immediate mode. Students were cautioned to avoid pressing <RETURN/ENTER> as this results in a SYNTAX ERROR message.

Now, in programming mode, students should type in a valid BASIC command followed by <RETURN/ENTER>. For example, type

```
10 PRINT "IS BASIC FOR BEGINNERS?"
```

and test the following options to learn through experimentation what is allowed in the programming mode:

- What happens when the above statement is entered in lower case letters? Students should be made aware of the function of the <SHIFT> and <CAPS LOCK>.



- What happens when single quotation marks or apostrophes are used instead of the double quotation marks?
- If FOR is replaced by FOUR, will the microcomputer correct this misspelling?
- If PRINT is misspelled as PRUNT, what results when the <RETURN/ENTER> is pressed?
- If the last two characters in the line are reversed so that the line reads:

```
10 PRINT "IS BASIC FOR BEGINNERS"?
```

does this cause an error when the <RETURN/ENTER> is pressed? Why?

- What happens if the space bar is not pressed to insert spaces between the 10 and the PRINT command and between the PRINT and the actual character string in quotes?
- On older typewriters, the lower case letter "l" was used instead of the numeral 1. What happens when the number 10 is entered as l0 using the lower case letter "l"?
- Most people do not distinguish between the letter "oh" and the numeral "zero". For example, in a postal code of R3K 1A0, the last three characters are often quoted as "one A oh" when it should be expressed as "one A zero" since the letters and numbers of a postal code alternate.
- What happens if the zero in the line number 10 is entered as the letter "oh"?

It is assumed that students are familiar with all letter and number keys as well as the various mathematical operation keys including +, -, *, ↑ (, and). However, depending on the microcomputer(s) available, students need to be familiar with the following special keys in programming mode:

Apple	Commodore	Radio Shack
<RETURN>	<RETURN>	<ENTER>
<SPACE BAR>	<SPACE BAR>	<SPACE BAR>
<SHIFT>	<SHIFT>	<SHIFT>
<RESET>	<SHIFT/LOCK>	<BREAK>
<CONTROL>	<RUN/STOP>	<CLEAR>
<CAPS LOCK>	<COMMODORE>	
<DELETE>	<CTRL>	
<ESC>	<CLR/HOME>	
<OPEN APPLE>	<INST/DEL>	
<CLOSED APPLE>	<RESTORE>	

B3. to select and to use computer operating commands as required;
(Level 1-Introduction)
(Level 2-Expansion)
(Level 3-Expansion)

Introduce or review the following system commands with students - LOAD, RUN, LIST, NEW, SAVE, DIRECTORY or CATALOG, and VERIFY. Select programs which are suitable, interesting, and error-free to provide practice in the use of these system commands.

LOAD and RUN - a detailed treatment involving different types of microcomputers appears with Unit I, Objective 5.

LIST - this command causes the computer to display on the screen all the lines of the computer program which are currently stored in the computer memory. This is true for all microcomputers.

138

139

NEW - clears the memory of all stored program lines. This is true for all microcomputers. Although the NEW command clears the computer memory, it does NOT clear the computer screen. Students may believe that because they can still SEE the program listing on the upper part of the screen, that it is still in memory. Teachers can show that the computer memory is empty by typing RUN or LIST.

SAVE commands - computer programs in memory may be stored on cassette tape or on diskette by using appropriate commands for the particular microcomputer.

Apple - saving on diskette:

1. Insert diskette
2. Type: SAVE program name
3. Press <RETURN>

PET or C-64 - saving on cassette tape:

1. Insert cassette
2. Type: SAVE"program name"
3. Press <RETURN>

Press REC and PLAY simultaneously on the cassette player. When READY message appears on the screen, the program is saved.

PET or C-64 - saving on diskette:

1. Insert diskette
2. Type: SAVE"0:program name",8
3. Press <RETURN>

When READY appears on the screen, saving is complete.

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
	TRS-80 - saving on tape: 1. Insert cassette 2. Type: CSAVE"program name" 3. Press <ENTER> The level of the volume setting is fairly critical for successful saving of the computer program. If an error message occurs, the CSAVE attempt should be repeated after adjusting the volume setting. TRS-80 - saving on diskette: 1. Insert diskette 2. Type: SAVE"program name" 3. Press <ENTER>	
B4. to formulate a flowchart as a diagramatic representation of a computer program; (Level 1-Introduction) (Level 2-Expansion) (Level 3-Expansion)	Flowcharting should be viewed as an aid to visualizing correct step by step sequencing, branching, and looping. While there are accepted formats for flowcharting, use of these is not essential. It is suggested that flowcharting activities begin with non-numerical examples such as making a peanut butter sandwich, washing a car or taking a bath and then progress to the flowcharting of simple BASIC programs. The following types of activities could be used: 1. Given a flowchart, write the corresponding program. 2. Given a program, write the flowchart. 3. Given a flowchart, identify the output.	IV-B4-1 LA IV-B4-2 LA IV-B4-3 LA

B5. to recognize the function, predict the output, and construct a BASIC program applying the statements PRINT, GOTO, FOR-NEXT, as well as programming punctuation techniques;
(Level 1-Introduction)
(Level 2-Expansion)
(Level 3-Expansion)

The BASIC programming section of this curriculum document suggests a variety of approaches useful for introducing students to the various BASIC commands and the language syntax. These include:

1. given a program, predict the output,
2. given the formatted output, write the BASIC program, and
3. given a problem, write a simple BASIC program which will solve it.

The teacher could integrate the use of flowcharting to illustrate the sequencing of programs in these exercises.

Before proceeding, the teacher and students should be aware that program lines are registered in the computer memory only after <RETURN/ENTER> is pressed. In the following programs, it is assumed that students will press <RETURN/ENTER> at the end of each line.

This section provides a series of BASIC programs which may be used for class demonstration or as student activities for discovering the functions and effects of various BASIC commands/statements. In each case, the student/teacher would need to enter the program and then run it.

PRINT

PROGRAM 1

```
10 PRINT"COMPUTERS ARE GREAT!"

RUN
```

Type NEW and then press <RETURN/ENTER> to erase the computer memory. Students should be taught to use the NEW command to erase the current program from memory rather than to turn the computer off and on again to clear the memory.

PROGRAM 2

```
10 ?"COMPUTERS ARE FANTASTIC!"
```

```
RUN
```

Now type:

```
20?"THEY NEVER MAKE MISTAKES"
```

```
RUN
```

> PRINT and ? both instruct the computer to show on the screen exactly what was placed within the quotation marks.

Continue typing:

```
40?"THEY ARE USEFUL"
35?"THEY ARE FUN"
5 ?"LET'S TALK ABOUT COMPUTERS"
```

then type LIST and press <RETURN/ENTER>

The computer sequences program lines according to their numbers regardless of typing order.

Now RUN the program.

Type 40 then press <RETURN/ENTER>

LIST the program now.

A line may be deleted by typing its line number and pressing <RETURN/ENTER>.

Have the students try several programs using the PRINT statement, such as their names, addresses, or short poems. Remember that the NEW command must be used to clear computer memory between programs.

Students should learn to clear the screen using the command appropriate for their microcomputer:

Apple	10 HOME
COMMODORE	10 PRINT "♥" (shifted <CLR/HOME> for the heart symbol)
TRS	10 CLS

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
	PROGRAM 3	IV-B5-1 H-o
	10 Clear the screen (NOTE: use the method appropriate for your microcomputer) 20 PRINT"SORRY, I ONLY JOG!"	IV-B5-2 H-o
	RUN	
	GOTO	
	PROGRAM 4	
	10 Clear the screen 20 PRINT"your name" 30 GOTO 20	
	RUN	
	If you type a line using the number of an existing line, the old line will be replaced by the new line.	
	GOTO causes the program to "branch" to the specified line. In Program 4 an endless repetition occurs.	

To break a program which is running, use the appropriate key:

Apple - press <CONTROL> and <C> simultaneously
Commodore - press <RUN/STOP>
TRS-80 - press <BREAK>

Have students try to predict what will happen if line 30 in Program 4 reads GOTO 10. Ask students to verify their prediction by changing the program.

Emphasize to students the difference between the number "zero" and the letter O on the computer keyboard.

Errors in programming should be dealt with as they occur. Syntax errors can occur for a variety of reasons. Some of these include incorrect spelling of BASIC statements, missing quotation marks or missing line numbers.

FOR-NEXT

```
PROGRAM 5


10 Clear the screen
20 FOR C=1 to 10
30 PRINT "HELLO"
40 NEXT C


RUN
```

Change the number 10 in line 20 to some other number and then RUN the program again.

> The FOR-NEXT loop structure consists of two program lines which together repeat whatever commands lie between them. The number of repetitions is controlled by the number in the FOR line.

PUNCTUATION

Place a comma at the end of line 30 in Program 5 and then RUN the program again.

IV-B5-3
H-o

Replace the comma with a semicolon in line 30 and then RUN the program again.

> Printed material normally occurs on a new screen line for each new PRINT statement.
>
> A semicolon over-rides this rule and then the material prints closely packed.
>
> A comma over-rides the separate line rule and causes the material to be spaced in columns.

IV-B5-4
H-o

IV-B5-5
H-o

IV-B5-6
H-o

B6. to recognize the function, predict the output, and construct a BASIC program applying numeric and string variables as well as the INPUT and the IF...THEN statements;
(Level 2-Introduction)
(Level 3-Expansion)

NUMERIC VARIABLES

PROGRAM 6

```
10 Clear the screen
20 LET A=36
30 LET B=2
40 LET C=A+B


RUN
```

Discuss the output. Now add the following lines:

```
25 PRINT A
35 PRINT B
45 PRINT C
```

LIST and RUN this program. Discuss the output.

Now change line 45 to:

```
45 PRINT"THE ANSWER IS ";C
```

RUN this to see the changes.

IV-B6-1
H-o

IV-B6-2
H-o

Delete lines 25 and 35. LIST the program.

Now change line 40 in PROGRAM 6 to use the operations of subtraction (-), multiplication (*), division (/), and exponentiation (↑) or (∧) depending on the microcomputer. RUN each new version.

> A letter or a letter and a number may be used as a variable name. The variable stands for some number.

> When assigning a value to a variable, the variable name must be on the left of the equal sign and its known value must be on the right.

PROGRAM 7

IV-B6-3
H-O

```
10 Clear the screen
20 FOR C=1 TO 10
30 PRINT C
40 NEXT C
```

IV-B6-4
H-o

```
RUN
```

Notice that the variable C is counting from 1 to 10 due to the FOR/NEXT loop and that line 30 prints the current value of that variable each time around the loop.

> PRINT C means "print on the screen the current value of the variable C."
>
> This should be clearly distinguished from PRINT"C" which means "print on the screen the letter C."

STRING VARIABLES

PROGRAM 8

```
10 Clear the screen
20 LET A$="GARBAGE IN"
30 LET B$=GARBAGE OUT"
40 LET C$=A$ + B$
50 PRINT C$
60 LET D$=B$ + A$
70 PRINT D$


RUN
```

Note that the program assigns two STRINGS (collection of characters); that is, A$ and B$. The strings are CONCATENATED ("glued" together); that is, A$ + B$ and B$ + A$. The resulting strings, C$ and D$, are printed.

IV-B6-5
H-o

IV-B6-6
H-o

> STRINGS are collections of alpha-numeric characters. String variables are identified by $.

INPUT

PROGRAM 9

```
10 Clear the screen
20 PRINT "WHAT IS YOUR NAME"
30 INPUT N$
40 PRINT"GLAD TO MEET YOU ";N$
50 PRINT N$;" HOW OLD ARE YOU"
60 INPUT A
70 PRINT"YOU ARE ";A;" YEARS OLD"


RUN
```

Discuss the function of the INPUT statement. Notice that the variable name must be appropriate - any variable which holds a number has no $ appended to its name while any variable which holds a character string must have a $ as part of the string variable name.

IV-B6-7
H-o

IV-B6-8
H-o

INPUT causes the computer to wait for the user to provide some data. An appropriate variable name must be provided to hold the item which the user supplies.

IF... THEN

Add the following lines to PROGRAM 9 and discuss how the IF...THEN statement works.

```
80 IF A<13 THEN 110
90 IF A=13 THEN 130
100 IF A >13 THEN 150
110 PRINT"SO YOU ARE NOT A TEENAGER YET!"
120 GOTO 160
130 PRINT"LUCKY 13!"
140 GOTO 160
150 PRINT"CONGRATULATIONS,YOU SURVIVED CHILDHOOD!"
160 END

RUN
```

IV-B6-9
H-o

IV-B6-10
H-o

Run this program several times using different values as INPUT to check the various responses of the program.

> IF...THEN statements contain a CONDITION AND AN ACTION in the same line in the form: IF (Condition) THEN (action). If the condition is met, the action is executed, otherwise the computer ignores the action and falls through to the next program line.

B7. to recognize the function, predict the output, and construct a BASIC program applying the STEP instruction and the READ/DATA statement; (Level 3-Introduction)

<u>STEP</u>

```
PROGRAM 10

10 Clear the screen
20 FOR T=1 TO 100
30 PRINT T
40 NEXT T
50 END

RUN
```

Now, modify line 20 as follows:

```
20 FOR T=1 TO 100 STEP 2

RUN
```

PROGRAM 11

IV-B7-1
H-o

```
10 Clear the screen
20 FOR C=10 TO 1 STEP -1
30 PRINT C
40 NEXT C
50 PRINT"BLAST OFF"
```

IV-B7-2
H-o

```
RUN
```

Discuss the negative increment.

> The STEP part of a FOR...NEXT loop structure assigns the increment by which the variable will count through the range. The increment may be positive or negative, integer or decimal. The STEP command may be omitted if the increment is 1.

<u>READ/DATA</u>

Teachers should discuss how the READ and DATA commands are used in BASIC.

PROGRAM 12

```
10 Clear the screen
20 READ A
30 PRINT A
100 DATA 7,8,15,9,11


RUN
```

Add the following lines:

```
     40 READ B
     50 PRINT B
```

LIST, RUN and discuss.

Now add:

```
     60 READ C,D
     70 PRINT C,D
```

LIST, RUN and discuss

Finally, add:

```
     80 READ E,F
     90 PRINT E,F
```

LIST, RUN and discuss. Try to modify the program to overcome the error(s) which occurred.

166

167

READ causes the computer to pick up from a DATA line enough items to fill the variables supplied in the READ line.

Successive READ statements cause pick-up of successive DATA items.

There must be at least as many DATA items provided as the READ variable requires or an ERROR message will occur.

PROGRAM 13

```
     10 Clear the screen
     20 READ N$,A
     30 PRINT N$,A
     40 DATA "JACK HAMMER",14
```

Run this program and discuss.

Now modify line 40 as follows:

```
     40 DATA "JACK HAMMER","FOURTEEN"
```

Run this and discuss the resulting ERROR message.
Try to modify the program to correct the error.

The variable types in the READ statements must correspond exactly to the items in DATA. Each number should correspond to a numeric variable and each alpha-numeric string to a string variable.

PROGRAM 14

```
10 Clear the screen
20 FOR C=1 TO 12
30 READ M$,D
40 PRINT M$;" HAS ";D;" DAYS."
50 NEXT C
60 DATA "JANUARY",31,"FEBRUARY",28,"MARCH",31,"APRIL",30
70 DATA "MAY",31,"JUNE",30,"JULY",31,"AUGUST",31
80 DATA "SEPTEMBER",30,"OCTOBER",31,"NOVEMBER,30,"DECEMBER",31
```

Run and discuss this program.

Experiment by changing the final number, 12, in line 20 to vary the number of loops.

Program 15 generates a drill about the provinces of Canada and their capitals. It could be used to illustrate the use of READ/DATA statements in a program or as a demonstration for a student project.

PROGRAM 15

```
20 Clear the screen
30 FOR I=1 TO 10
40 READ P$, C$
50 PRINT "WHAT IS THE CAPITAL OF ";P$
60 INPUT G$
70 IF G$=C$ THEN 110
80 PRINT "SORRY.....YOU ARE INCORRECT."
90 PRINT "THE ANSWER IS ";C$
```

```
100 GOTO 120
110 PRINT "CONGRATULATIONS!"
120 PRINT
130 NEXT I
140 DATA "BRITISH COLUMBIA", "VICTORIA"
150 DATA "ALBERTA", "EDMONTON"
160 DATA "SASKATCHEWAN", "REGINA"
170 DATA "MANITOBA", "WINNIPEG"
180 DATA "ONTARIO", "TORONTO"
190 DATA "QUEBEC", "QUEBEC CITY"
200 DATA "NEW BRUNSWICK", "SAINT JOHN"
210 DATA "PRINCE EDWARD ISLAND", "CHARLOTTETOWN"
220 DATA "NOVA SCOTIA", "HALIFAX"
230 DATA "NEWFOUNDLAND", ST. JOHN'S"
240 END
```

IV-B7-3
H-o

IV-B7-4
H-o

B8. to document the structure and logic of a BASIC program using the REM statement.
(Level 3-Introduction)

REM

REM statements or REMarks are an essential part of every programming language because they are used to document or label the parts of the computer program. Documentation is a crucial part of every computer program because it provides an explanation for the logic of the program design and allows other people to read the program and understand how the component parts interact. Teachers should encourage the students to use REM statements at the beginning of all programs to identify the programmer and to define the variables. For example:

```
10 REM SUSIE SMITH
20 REM CALCULATES THE AVERAGE
```

REM causes the text in that program line to be ignored by the computer. The material is there only for the person who is reading the actual program listing.

LOGO SECTION

Often, Logo has been described as a programming language suitable for children and as such has been suggested for implementation in K-3 and 4-6 Computer Awareness in Manitoba. However, Logo can be much more than simple turtle graphics. At the 7-9 level, the study of variables and coordinate geometry in Logo reinforce concepts taught in the mathematics curriculum and the advanced use of repetition, iteration, and recursion helps to illustrate some very powerful computer programming ideas. In addition, further refining of top-down problem-solving techniques is accomplished through the use of super- and subprocedures and the manipulation of words (lists) is introduced.

The "turtle" is a graphic character or robotic device which is controlled through the Logo computer language.

The Logo language is commercially available on diskette for specific microcomputers. In order to complete this section of Unit IV, the Logo language is required. The following list of Logo languages may help the teacher identify and acquire a suitable version for use in the classroom. Teachers using Commodore PET or TRS-80 Model III/IV microcomputers are advised to select another option section as there is no commercially available Logo language for these microcomputers.

A. APPLE MICROCOMPUTERS

Apple II+, Apple IIe and/or Apple IIc
- Apple Logo I - commercially available
- Apple Logo II - commercially available
- Krell Logo - commercially available
- Sprite Logo - commercially available
- Terrapin Logo - commercially available

B. COMMODORE MICROCOMPUTERS

Commodore 64
- Commodore 64 Logo (version of Terrapin) - commercially available

C. RADIO SHACK MICROCOMPUTERS

Radio Shack Color
- Color Logo - commercially available

Recommended print materials include:

1. Abelson, Harold. Apple Logo. Peterborough, NH: Byte/McGraw-Hill, 1982.
2. Bearden, Donna, Kathleen Martin, and Jim Muller. The Turtle's Sourcebook. Reston, VA: Prentice-Hall Company, 1983.
3. Papert, Seymour. Mindstorms. New York: Basic Books, Inc., 1980.
4. Watt, Daniel. Learning With Logo. New York: McGraw-Hill, 1983.

L1. to manipulate a robotic device;
(Level 1-Introduction)

As a concrete introduction to the Logo language, students should be given the opportunity to manipulate a robotic device. There are many different robotic devices which can be used to satisfy this objective. Some of these robots are controlled by Logo language software while others are stand alone robots which are programmed using their own unique commands. All mobile robots are concrete pre-cursors to Logo in the sense that they move in two-dimensions. Students without access to any robotic device can begin their Logo explorations instead by programming "human turtles" or manipulating "concrete turtles" as described in "The Turtle's Sourcebook" by Bearden, Martin and Muller.

ROBOTIC DEVICES CONTROLLED BY LOGO LANGUAGE SOFTWARE

Note: Teachers are reminded that prior to purchasing any of the following robotic devices, they should determine whether the robot can be interfaced with their particular model of microcomputer.

VALIANT TURTLE
Kobetek Systems Limited
1113 Commercial Street
New Minas, Nova Scotia B4N 3E6
Approximately $375.00 Canadian

Turtle TOT
Harvard Associates Inc.
260 Beacon Street
Somerville, MA 02143
U.S.A.
Approximately $300.00 American

TALKING TURTLE TOT
Harvard Associates Inc.
260 Beacon Street
Somerville, MA 02143
U.S.A.
Approximately $1000.00 American

FRIENDLY ROBOTIC EDUCATIONAL DEVICE (FRED)
Androbot Inc.
550 Charcot Avenue
San Jose, CA 95131
Approximately $499.00 American

STAND ALONE ROBOTIC DEVICES

COMPUROBOT
The Wizard
18584 Carlwyn Drive
Castro Valley, CA 94546
Approximately $40.00 American

VERBOT
The Wizard
18584 Carlwyn Drive
Castro Valley, CA 94546
Approximately $80.00 American

BATTLE ARM CLAW
Radio Shack Computer Stores
Approximately $40.00 Canadian

The Battle Arm Claw can be interfaced to a number of microcomputers. For additional information contact the Educational Technology Program.

L2. to manipulate the Logo "screen turtle" in immediate mode;
(Level 1-Introduction)
(Level 2-Expansion)
(Level 3-Expansion)

Once students have manipulated a robotic device, "programmed" the "human turtle," or manipulated a "concrete turtle," they can begin exploring with the "screen turtle" using Logo in immediate mode. In immediate mode the screen turtle executes the Logo commands immediately after <RETURN> or <ENTER> is pressed. Student explorations with the Logo "screen turtle" in immediate mode is preparation for the writing of Logo procedures in programming mode.

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
	Emphasis should be placed on the process of planning, recording, testing, and revising the steps needed to create each student's Logo design in immediate mode.	
	Students should be encouraged to record their Logo work in a Logo Log Book. Students may use this book to record their Logo work for future reference. Teachers may use the student's Logo log book to follow the progress of the student.	IV-L2-1 Lo/H-o
	Suggested activities:	
	* The teacher could create transparencies of mazes, maps, or word puzzles which might integrate with current topics in mathematics, science, social studies or language arts. These transparencies can be placed over the computer screen in order to direct the students' exploration in immediate mode. Students could be encouraged to create transparency based activities to challenge each other.	
	* Students could change or be assigned one letter of the block alphabet. Once each student has created and debugged the sequence of commands needed to produce their letter, this sequence could be used as a basis for a student's first procedure to be created during work on the next objective. Later, the class can print out messages by creating superprocedures which contain the letter-producing sequences as subprocedures. Using a Logo-controlled robotic device, messages can be printed out in large format to create signs for bulletin boards.	

L3. to use the REPEAT command;
(Level 1-Introduction)
(Level 2-Expansion)

Students often spontaneously create designs in which a pattern of primitives is repeated. Examples of these designs include the triangle, the square, the hexagon, or the octagon.

At Level 1, students could be introduced to the REPEAT command, a method which simplifies the creation of designs containing a repeated pattern of primitives. The Logo REPEAT command allows students to specify the pattern to be repeated and the number of repetitions. For example, students may have created a triangle using the following commands:

```
FORWARD 70
RIGHT 120
FORWARD 70
RIGHT 120
FORWARD 70
RIGHT 120
```

Students should notice that the pattern:

```
FORWARD 70
RIGHT 120
```

must be repeated three times in order to complete the shape. The creation of the triangle may be simplified by using the REPEAT command as follows:

```
REPEAT 3 [FORWARD 70 RIGHT 120]
```

The REPEAT command allows the turtle to repeat a list of commands a specified number of times. The REPEAT command has two inputs:

. number of times to repeat
. [what is to be repeated]

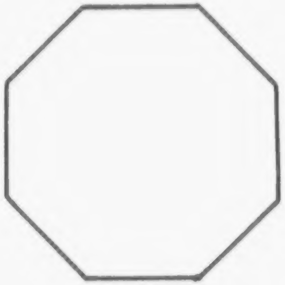
<u>Note</u>: The sequence of commands to be repeated must be enclosed within square brackets.

The REPEAT command may be used in immediate mode. For example:

```
REPEAT 8 [FORWARD 40 RIGHT 45]
```

instructs the turtle to repeat, 8 times, the commands found within the square brackets.

The turtle draws the following shape:



Suggested activities:

186

- Students should be given the opportunity to explore the REPEAT command in immediate mode by changing the pattern to be repeated and/or the number of repetitions.

IV-L3-1

Lo/H-o/Ma

187

The REPEAT command can be used in a number of ways:

1. in immediate mode
2. within a procedure
3. to contain a procedure

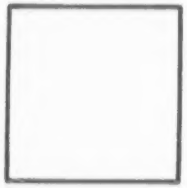
In Level 1, students should experiment with the use of the REPEAT command in immediate mode.

In Level 2, after having used procedures, the students could use the REPEAT command within a procedure and/or to contain a procedure.

REPEAT WITHIN A PROCEDURE

```
TO BOX
REPEAT 4 [FORWARD 40 RIGHT 90]
END
```

The turtle draws the following shape when BOX is typed.



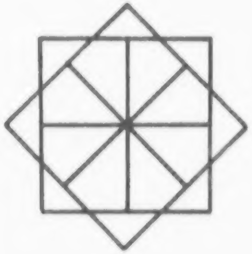
Suggested activity:

- Challenge the students to use the REPEAT command to produce a closed shape such as the triangle, square, rectangle, pentagon, hexagon, or star.

REPEAT CONTAINING A PROCEDURE

```
TO FLOWER
REPEAT 8 [BOX RIGHT 45]
END
```

The turtle draws the following shape when FLOWER is typed.



Suggested activity:

- Students should choose a procedure from their Logo Log Book and write a REPEAT statement containing their product. Challenge the students to experiment with the REPEAT statement until the new shape is "closed."

L4. to create, to edit, and to save Logo procedures, subprocedures, and superprocedures;
(Level 1-Introduction)
(Level 2-Expansion)
(Level 3-Expansion)

Once students have explored the Logo language with the "screen turtle" in immediate mode, they can be introduced to the concept of procedure-writing or programming.

Programming mode is different from immediate mode in that it stores instructions in the form of a procedure. A procedure contains the individual steps in the solution of a problem. Every procedure must be given a unique name in order to identify and to use it in the creation of a superprocedure.

A superprocedure is a complex procedure composed of a number of simple subprocedures.

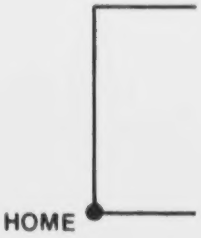
As each version of the Logo language has a unique system for creating, saving, and editing procedures, teachers should consult the user's guide for their version of Logo to determine the appropriate commands.

Level 1

During the discussion in level 1, the following demonstration and student activities could be combined to create the letters of the alphabet using Logo procedures. Each letter will be a simple procedure and student monograms can be created as superprocedures.

Teachers should demonstrate how to create a simple procedure. For example, the procedure to create the letter C follows:

```
TO C
RIGHT 90
FORWARD 30
BACK 30
LEFT 90
FORWARD 60
RIGHT 90
FORWARD 30
PENUP
HOME
PENDOWN
END
```



Now run the procedure and debug if necessary. Teachers should note that since this procedure will be used in the creation of a superprocedure called MONOGRAM, two conventions will be observed:

1. the turtle begins every letter in the lower left corner facing up on the screen.
2. at the completion of each letter, the turtle picks up the pen, returns HOME and puts the pen down to be ready to draw the next letter.

Teachers should demonstrate how to SAVE the procedure named C.

In order to show the students that the procedure C has been saved on to the Logo data diskette, remove the data diskette and reboot the system with the Logo program. Now try to run the program C. The turtle will give a message such as "I don't know how to C." At this point, insert and catalogue the data diskette. Students will see that the procedure named C has been saved. Now load the procedure named C back into the workspace.

The following section will deal with editing a procedure and a procedure name. Teachers should consult the user's guide for their version of Logo to determine the proper commands to use.

In order to illustrate the process of editing a procedure and a procedure name, rename the procedure C as O and insert the new commands necessary to complete the procedure.

A possible solution follows:

```
TO O
RIGHT 90
FORWARD 30
BACK 30
LEFT 90
FORWARD 60
RIGHT 90
```

```
FORWARD 30
RIGHT 90
FORWARD 60
PENUP
HOME
PENDOWN
END
```

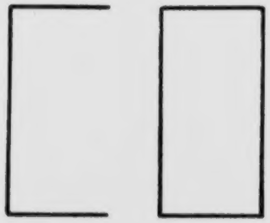
- Students could be asked to provide alternative solutions to produce the letter O. HINT: Try using the REPEAT command.

Each member of the class could create a procedure to produce one letter of the alphabet observing the two conventions previously mentioned. Using the activity sheet, students could plan, create, edit, and save their procedure and share it with the rest of the class once it has been completely debugged. The teacher may wish to have students save their procedures on one class diskette to facilitate the sharing and loading of procedures.

IV-L4-1
Lo/H-o

After students have learned how to create, edit and save simple procedures, they could be shown how to use these simple procedures as part of a superprocedure. From the previous examples, two simple procedures C and O were created. To produce the monogram CO, the following superprocedure could be created:

```
TO CO
MOVE 1
C
MOVE 2
O
END
```



It should be noted that the two "move procedures" are required to orient the turtle in the correct position before beginning each letter.

- * Using the alphabet procedures saved from activity IV-L4-1, students may produce a monogram of their three initials by writing a superprocedure.

Level 2

After students have had experience combining simple procedures into superprocedures, the teacher should place the emphasis on a more organized approach to problem solving.

The following discussion will deal with the top-down approach to problem solving.

Top-down problem solving starts from the "top" or general ideas, and systematically works "down" to the details.

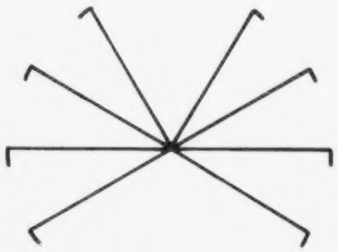
Top-down problem solving can be broken down into the following five steps:

1. Sketch a diagram of the design which will be created by the superprocedure. Give the superprocedure the same name as the design.
2. Label the component parts of the diagram. In the creation of the superprocedure, the names of the component parts will be used as the names of the subprocedures.
3. Write and test the superprocedure.

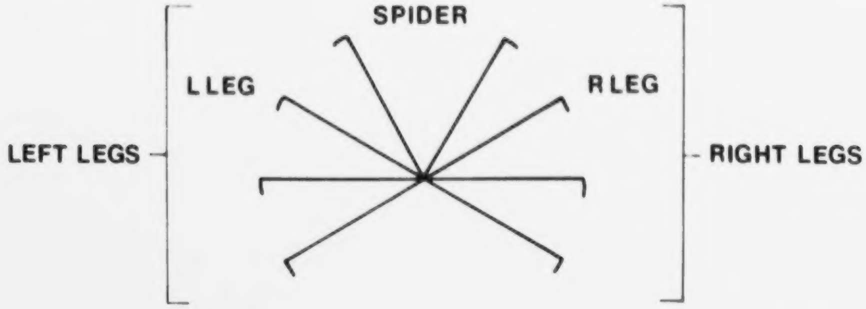
4. Write the subprocedure called for by the superprocedure.
5. Test the superprocedure and repeat steps 4 and 5 until the superprocedure produces the desired design.

The following explanation is an illustration of the five steps involved in top-down problem solving. The teacher may wish to use it in a class demonstration.

Step 1. Sketch



Step 2. Label



Step 3. Superprocedure: dealing with general concepts.

```
TO SPIDER
TURN1
RIGHTLEGS
TURN2
LEFTLEGS
END
```

NOTE: Enter this superprocedure into the computer. Test the superprocedure by typing SPIDER. The computer should respond with "I DONT KNOW HOW TO SPIDER."

Step 4. Subprocedure: dealing with details of each concept.

```
TO TURN1
RIGHT 30
END
```

NOTE: Enter this subprocedure into the computer.

Step 5. Test the superprocedure SPIDER.

NOTE: The teacher will find that the turtle will turn and then respond "I DONT KNOW HOW TO RIGHTLEGS."

Repeat Step 4 by writing the subprocedure RIGHTLEGS and entering it into the computer.

```
TO RIGHTLEGS
REPEAT 4 [RLEG RT 30]
```

Repeat Step 5 by testing the superprocedure SPIDER. The teacher will find that the turtle will turn and respond "I DONT KNOW HOW TO RLEG."

Repeat STEP 4 by writing the subprocedure RLEG and entering it into the computer.

```
TO RLEG
FORWARD 40
RIGHT 90
FORWARD 15
BACK 15
LEFT 90
BACK 40
END
```

Repeat Step 5. The procedure will draw the four right legs of the spider, then stop and respond "I DONT KNOW HOW TO TURN2."

Continue repeating Steps 4 and 5 until the superprocedure SPIDER produces the spider sketched in Step 1.

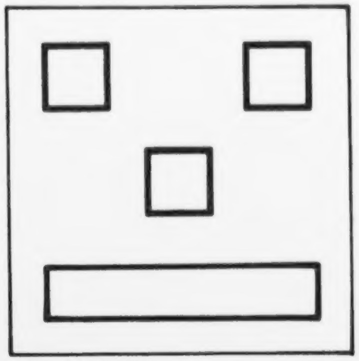
Teachers will note that in the creation of RIGHTLEGS the REPEAT command has been used within the procedure (RIGHTLEGS) and the procedure RLEG has been used within a REPEAT statement. See Objective 3 to review the REPEAT command.

* Using the top-down problem solving approach, students working individually or in pairs, could complete a project related to a theme being studied in Social Studies, Science, or Mathematics.

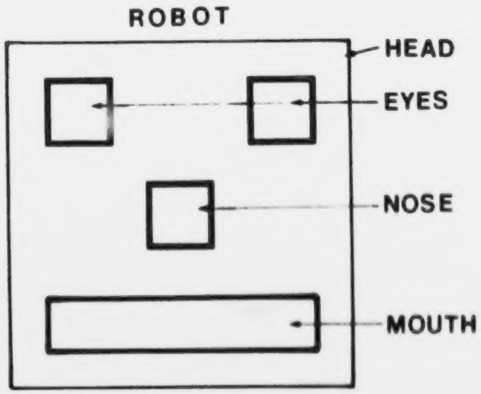
Level 3

After students have completed Level 2, they should be able to relate to the concept of a procedure tree as a diagrammatic representation of the top-down problem solving approach.

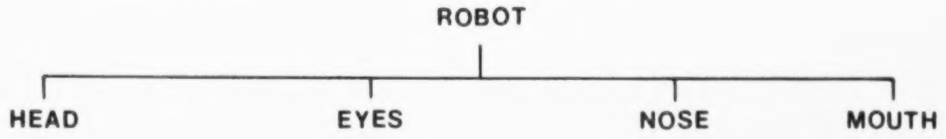
Step 1. Sketch.



Step 2. Label.



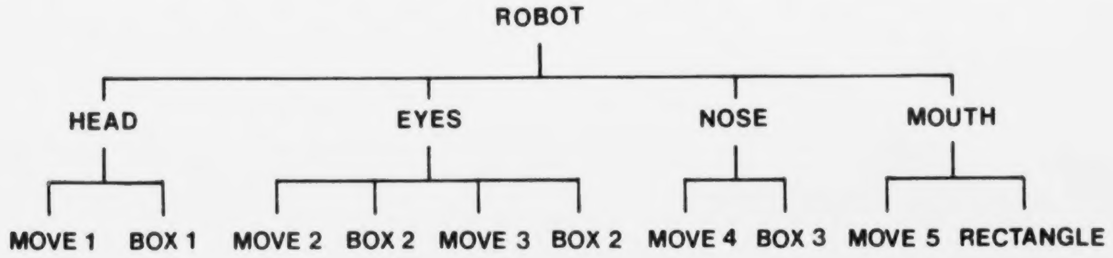
Step 3. Superprocedure. Before entering the superprocedure ROBOT into the computer draw a procedure tree to help plan the superprocedure.


ROBOT
HEAD
EYES
NOSE
MOUTH

This is the first level of the procedure tree and will assist in the creation of the superprocedure ROBOT.

```
TO ROBOT
HEAD
EYES
MOUTH
END
```

Step 4. Subprocedure. In order to plan the individual subprocedures the procedure tree should be extended to the next level.


ROBOT
HEAD
EYES
NOSE
MOUTH
MOVE 1
BOX 1
MOVE 2
BOX 2
MOVE 3
BOX 2
MOVE 4
BOX 3
MOVE 5
RECTANGLE

At this level of the procedure tree each procedure now must be defined in terms of logo primitives.

- * Using the procedure tree as an aid in the top-down problem solving approach, students could work in pairs or in a small group to complete a project on a seasonal theme; for example, Halloween or Valentine's Day.
- * Within the ROBOT superprocedure, the BOX subprocedure is required a number of times but in different sizes. Using their knowledge of variables, students should be encouraged to write a single procedure, which with inputs, could be used to produce the various size boxes required within the ROBOT superprocedure.

L5. to create recursive Logo procedures;
(Level 1-Introduction)
(Level 2-Expansion)
(Level 3-Expansion)

A Logo procedure is recursive when it creates a copy of itself. There are two forms of recursion:

. Tail-end recursion.
. Embedded recursion.

Tail-end recursion will be introduced at Level 1 and embedded recursion will be introduced at Level 2. Level 3 is to be an extension of both forms of recursion.

Level 1

To introduce the concept of recursion, teachers could point out processes in everyday life which are recursive. Some common concrete examples of recursion include the following:

. Two mirrors placed at right angles to each other will reflect recursively any object placed between the mirrors. One mirror reflects the other mirror reflecting the object, reflecting the other mirror reflecting the object, and so on.

. Any song which may be sung in the form of a round is a musical example of recursion. Examples of such songs are "Frère Jacques" and "Row, Row, Row Your Boat." Round singing is recursive because the singing of the first part by one group is a signal for the singing of the first part by another group and so on.

. Advertising agencies occasionally make use of recursion in the promotion of a product. This is because the recursive image is unusual and interesting to look at. One example can be seen on the Morton's salt box which shows a little girl in the rain holding a Morton's salt box with the same image on that salt box and so on.

* Students could be given the opportunity to experiment with small mirrors and full length mirrors in their exploration of recursion.

* The class could be arranged in groups and asked to sing one of the examples of musical recursion. The singing could be recorded on tape and played back for the students to analyze.

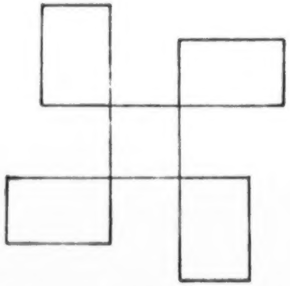
* Students could be encouraged to find examples of recursion in contemporary music and bring them to class.

* Students could be asked to design a recursive image using a geometric shape, a pattern or a picture.

- * A teacher with access to a video cassette recorder and video camera attachment could demonstrate recursion by focusing the camera on the television display. The camera will take a picture of the television screen and surrounding objects. On the television screen will be a picture of that same television screen and surrounding objects and so on.

Tail-end recursion is a procedure which contains its own name as the last statement in the procedure. For example:

```
TO SHAPE
FORWARD 70
RIGHT 90
FORWARD 30
RIGHT 90
FORWARD 20
RIGHT 90
SHAPE
END
```



NOTE: This recursive procedure is unending and must be stopped manually. Consult your Logo user's manual for the appropriate command.

- * Students could choose a simple procedure from their Logo Log Book, such as the procedure which produces their first initial, and edit it to make use of tail-end recursion. This will create an interesting design.

214 * Students could choose one of their procedures which contains the REPEAT command and write a new procedure that makes use of recursion instead of REPEAT. Note that the procedure using REPEAT stops automatically after executing the correct 215

number of repetitions. However, the new tail-end recursive procedure must be stopped manually. For example:

Using REPEAT

```
TO STAR
REPEAT 5 [FORWARD 50 RIGHT 144]
END
```

Using recursion

```
TO STAR
FORWARD 50
RIGHT 144
STAR
END
```

After students have been introduced to variables in objective L6 , they will be able to insert conditions which check the number of recursive calls and stop the procedure when the condition is met.

Level 2

Students should review the concept of recursion and compare the use of tail-end recursion with that of repetition.

As level 2 students have been exposed to variables in objective L6 in level 1, they will be able to insert a test condition to stop the procedure instead of having to rely on the manual stopping method.

As an example, the SHAPE procedure demonstrated at level 1 can be edited to include a variable and a condition to stop the procedure after a variable number of cycles of recursion.

```
TO SHAPE  :NUMBER
IF  :NUMBER = 0 [STOP]
FORWARD 70
RIGHT 90
FORWARD 30
RIGHT 90
FORWARD 20
RIGHT 90
SHAPE  :NUMBER - 1
END
```

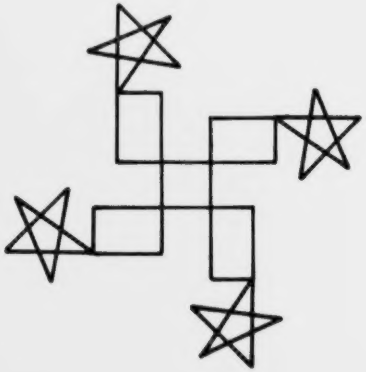
The students should be given the opportunity to experiment with different variables in the SHAPE procedure, such as SHAPE 1, SHAPE 2, SHAPE 3, and so on. Teachers should guide the discussion by asking students to predict how many different "shapes" can be drawn using this new procedure. Students could be encouraged to edit this procedure further in order to produce eight or more different "shapes."

Once students have reviewed tail-end recursion, the concept of recursion should be extended to include embedded recursion.

Embedded recursion is different from tail-end recursion because although the name of the procedure is included within the procedure itself, it is NOT the final statement in the procedure.

For example, the SHAPE procedure used previously to demonstrate tail-end recursion can be edited to illustrate embedded recursion.

```
TO SHAPE  :NUMBER
IF  :NUMBER = 0 [STOP]
FORWARD 70
RIGHT 90
FORWARD 30
RIGHT 90
FORWARD 20
RIGHT 90
SHAPE  :NUMBER - 1
FORWARD 70
RIGHT 90
FORWARD 30
REPEAT 5 [FORWARD 40 RIGHT 144]
RIGHT 90
FORWARD 90
RIGHT 90
END
```



The method of execution of a procedure containing embedded recursion can be illustrated using the SHAPE procedure. First of all, the SHAPE :NUMBER procedure cycles through a certain number of times. The number of cycles depends upon the value of the variable :NUMBER. For example, SHAPE 3 will have three cycles. The condition, which tests to see that the required number of cycles is executed, is tested in the first statement of the procedure. Thus, in every cycle, all the statements which occur before the recursive call are executed immediately. However, the statements which occur after the recursive call are stored as blocks in a "stack." The statements stored in the stack are not executed until all the initial recursion has been executed. When the blocks of statements in the stack are finally executed, they are executed in reverse order under the rule "first in, last out."

Suggested activities:

- Students could be encouraged to edit one of the tail-end procedures they created previously, to include the use of embedded recursion. Students must be cautioned to use variables to create a test condition within the procedure, otherwise the procedure will never get to the point of executing the blocks of statements stored in the stack.

Level 3

Level 3 students should review the concepts of tail-end and embedded recursion, and should be encouraged to apply these techniques in their work with the list processing and coordinate geometry aspects of Logo covered in Objectives L8 and L7 , respectively.

The following example illustrates the use of two variables and embedded recursion within the SHAPE procedure.

```
TO SHAPE :NUMBER :SIDE
IF  :NUMBER = 0 [STOP]
FORWARD 70
RIGHT 90
FORWARD 30
RIGHT 90
FORWARD 20
RIGHT 90
SHAPE  :NUMBER-1
FORWARD 70
RIGHT 90
FORWARD 30
REPEAT 5 [FORWARD :SIDE RIGHT 144]
RIGHT 90
FORWARD 20
RIGHT 90
END
```

Note that this example illustrates the reverse order of execution of the stack discussed at Level 2. The stars are drawn in increasing order of size, even though the value of the variable :SIDE within the procedure is decremented (i.e., getting smaller).

Suggested activity:

- Students could illustrate the reverse operation of the stack by including the use of a variable as the value for controlling the length of one of the FORWARD statements which occur after the recursive call in an embedded recursive procedure.

L6 . to write Logo procedures containing variables;
(Level 1-Introduction)
(Level 2-Expansion)
(Level 3-Expansion)

A variable is the name of a changeable quantity. In Logo, a variable can be a number, a word, or a list. This objective will deal only with numeric variables. This study of variables in Logo can be integrated with the algebraic study of variables in the mathematics curriculum.

Any variable used within a Logo procedure must be introduced at the time the procedure is named. For example, TO SQUARE :LENGTH, where SQUARE is the name of the procedure and :LENGTH is the variable associated with the procedure. The :(to be read, "dots") indicates that the label that follows is the name of a variable. When the procedure SQUARE is called, a value for the variable must be entered at the same time. For example, SQUARE 20 will produce a square with sides of length 20.

Level 1

At Level 1, students should be exposed to Logo procedures containing a single variable. For example,

```
TO STOPSIGN :SIZE
REPEAT 8 [FORWARD :SIZE RIGHT 45]
END
```

Students could experiment with the variable :SIZE by inputting different numbers in order to discover what variable will produce the largest stop sign that will still fit on the screen.

In their work with the REPEAT command in Objective 3, students should have discovered an interesting relationship between the number of repeats in a polygon procedure, and the size of the angle.

In all cases, to create a closed shape the product of the "number of repeats" and the "turning angle" equals 360. For example:

REPEAT 3 [FORWARD 20 RIGHT 120] creates a closed shape with 3 sides (triangle) where the product of the number of repeats (3) and the turning angle (120) equals 360.

REPEAT 4 [FORWARD 20 RIGHT 90] creates a closed shape with 4 sides (square) where the product of the number of repeats (4) and the turning angle (90) equals 360.

Also, students can use a variable to control the turning angle. For example:

```
TO DESIGN :ANGLE
REPEAT 360/:ANGLE [TRI RIGHT:ANGLE]
END

TO TRI
REPEAT 3 [FORWARD 20 RIGHT 120]
END
```

Students should experiment with the variable :ANGLE by inputting numbers to discover the relationship between the variable :ANGLE and the number of triangles produced.

Variables may also be used to specify the number of repetitions within the REPEAT command. For example:

```
TO POLYGON :NUMBER
REPEAT :NUMBER [FORWARD 40 RIGHT 360/:NUMBER]
END
```

Students should experiment with the variable :NUMBER to discover the relationship between the value of the input and the number of sides produced in the polygon.

Suggested activities:

- * Students should take one of the procedures from their Logo Log Book. For example, the procedure to draw their initial and edit the procedure to use variables to draw an initial of different sizes.
- * Students should edit one of the procedures they wrote to produce a closed polygon and edit it to use a variable number of degrees to rotate that polygon.

Level 2

At Level 1, students were introduced to the use of one variable within a procedure. At Level 2, students will be exposed to Logo procedures containing two or more variables. For example:

```
   TO POLYGON :LENGTH :ANGLE
   REPEAT 360/:ANGLE [FORWARD :LENGTH RIGHT :ANGLE]
   END
```

This is a very general procedure which will produce a polygon with a variable length of side and a variable number of sides.

Students should experiment with different values of :LENGTH and :ANGLE in order to produce polygons of varying size and shape.

Level 3

Students should review the concept of using variables within Logo procedures as discussed in levels 1 and 2.

A very powerful use of variables occurs when the variables themselves change within the execution of a recursive procedure. For example:

```
TO POLYSPI :LENGTH :NUMBER
REPEAT :NUMBER [FORWARD :LENGTH RIGHT 360/:NUMBER]
LEFT 10
POLYSPI :LENGTH +5 :NUMBER
END
```

The variable :LENGTH is incremented by 5 (+5) in the tail-end recursion statement. This causes the size of the polygon to increase 5 turtle steps each time it is drawn.

L7. to use Logo commands involving coordinate geometry;
(Level 2-Introduction)

Logo can employ turtle commands which either provide the turtle's location on the screen or move the turtle to an exact position on the screen using X and Y coordinates. These X and Y coordinates are measured from the centre of the screen. X gives horizontal/sideways position, while Y gives vertical/up and down position. Students should be introduced to the following Logo commands which provide information on the turtle's position on the screen:

XCOR - outputs the turtle's x-coordinate as a decimal number. Requires no inputs.

YCOR - outputs the turtle's y-coordinate as a decimal number. Requires no inputs.

HEADING - outputs the turtle's heading as a decimal number between 0 and 360. When the turtle has a heading of 0 it is pointing directly up.

TOWARDS - requires two numbers as input. These are interpreted as the x- and y-coordinates of a point on the screen. TOWARDS outputs the heading from the turtle to that point.

Also, students should be introduced to the following Logo commands which move the turtle to a specific location on the screen:

SETX - requires one numeric input and moves the turtle horizontally to the specified (input) coordinate. Positive values move the turtle to the right side of the screen. Negative values move it to the left of the screen. Draws a line if the pen is down.

SETY - requires one numeric input and moves the turtle vertically to the specified coordinate. Positive values move the turtle to the upper half of the screen; whereas, negative values move it to the lower half. Draws a line if the pen is down.

SETXY - takes two numeric inputs. Moves the turtle to a specified point. 0,0 is the centre of the screen. As with all primitives with two or more inputs, when the second input or y-coordinate is a negative number, it should be enclosed by parentheses to be certain that Logo doesn't subtract the two input values.

Note: Some versions of Logo use SETPOS [X Y] where the two numbers for x and y are enclosed in brackets.

SETHEADING or SETH - requires one numeric input. The input is interpreted as the number of degrees which rotates the turtle clockwise for positive values.

Suggested activities:

* Given a plane figure on the screen, determine the coordinates of its vertices.

* Draw a dot-to-dot picture using coordinates. Examples could include geometric shapes, outlines of letters/numerals, and simple pictures such as that of a sailboat, house, dog, or car.

L8. to understand and to use some list-processing capabilities of Logo. (Level 3-Introduction)

The idea is to help students understand something about how computers do data processing. Data processing involves getting the computer to take in, store, change, and print information.

Logo's facility with words and lists makes it ideal for writing conversational programs, quizzes, pig-Latin translators, and even programs that teach and/or learn. In short, Logo is ideal for all programs that need to manipulate lists of information.

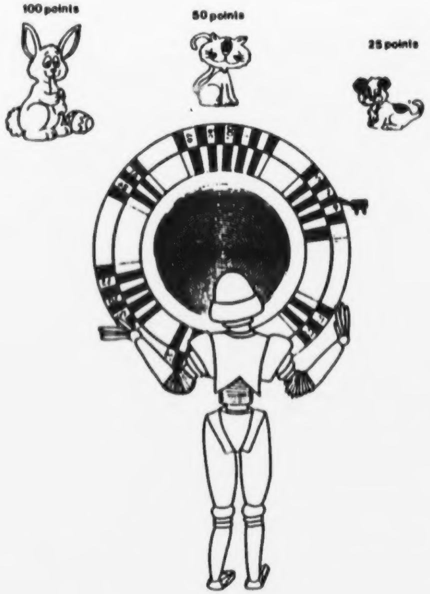
Teachers are reminded to limit the study of list-processing based on the ability of their students. Work in this section should not become tedious or boring and should emphasize creativity and interest.

Depending on student interest, teachers could allow groups of students to concentrate on any of the following:

- interactive video programs
- quiz programs
- programs that write and manipulate
- programs that play games
- programs that learn

Refer to the following resources:

1. Abelson, Harold. Apple Logo.
2. Watt, Daniel. Learning with Logo.



TOOL USES

T1. to use a computer to manipulate and to edit textual material;
(Level 1-Introduction)
(Level 2-Expansion)
(Level 3-Expansion)

The computer software used to manipulate and edit textual material is called word processing software.

Word Processing:

Of all the present uses of computers, word processing will quite possibly involve more people directly with computers than will any other computer activity. Essentially, word processing consists of using computer software to create text in "soft" form on the screen, then to edit, store, retrieve and print that text in "hard" form on paper, according to desired format specifications.

Word processing software can be very complex and may require extensive practice to achieve proficiency. However, a small amount of word processing skill will allow a student to type attractively formatted letters, essays or notes without time-consuming rewriting.

In Level 1, students will work with word processing software to retrieve and manipulate files which have been previously stored by the teacher on diskette. The various activities will give students experience in the editing functions (cursor movement, insertion, deletion) and in file retrieval.

At Level 2, students will review previous skills and enlarge upon word processing routines, emphasizing the printing of text using specific formatting commands.

Level 3 students are to review and to reinforce word processing skills through production of a word processed assignment for some other class/subject area. For example, students could produce an English essay or science lab report using word processing.

Teachers should be aware that:

The activities involved in this objective are not specific to a particular computer or word processing software package. However, the teacher should be familiar with the use of the word processing software available.

The files, referred to in the activities which follow, must be typed and stored on a data diskette which is accessible by the word processor being used. Time spent by the teacher in creating these files will serve as a learning or review session and will not be wasted.

The teacher will be required to prepare student instruction sheets with the specific commands that are necessary to complete the activities using their word processing program.

LEVEL 1

At Level 1, students are to be introduced to the primary functions of the word processor through hands-on activities which integrate with other disciplines in the 7-9 curriculum.

Before using the outlined activities with students, the teacher should acquire word processing software and become familiar with it by entering the data files needed for the activities in Level 1. A teacher already proficient in the use of their chosen word processor could get a knowledgeable data processing or computer science student to enter the data files for them.

The first activity "MARTIN'S MYSTERY" is designed to develop problem-solving skills as well as students' skills in accessing the data files which will be used as the basis for all other introductory word processing activities. Students must become familiar with the structure of the menus in their particular word processing software. In addition, the procedures for cataloguing

IV-T1-1
TU

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
	a data disk and for retrieving a file will be particular to the word processing software being used and must be learned at this time.	
	Accessing files from a data diskette is a critical step in the editing and printing of text. The activity IV-T1-1 involves ten data files which must be accessed and provides sufficient practice for students to become knowledgeable in these procedures.	
	The second activity "The A-maze-ing Cursor" introduces the students to cursor manipulation. The cursor is a small, blinking square which indicates the position where the next typed text will appear. Every word processor has a particular method for manipulating the cursor so that text can be read or edited. In some cases, arrow keys are used, in other cases, a two key combination is required. Activity IV-T1-2 gives students practice in guiding the cursor through a maze.	IV-T1-2 TU
	The third word processing activity "Which Witch" uses content of a language arts nature, specifically that of identifying appropriate homonyms in context, to introduce and practice the word processing skill of deleting words. Before assigning this activity to the students, the teacher should become familiar with the character and word deletion procedures for their particular word processor, and should demonstrate these to the class.	IV-T1-3 TU
	As an extension, students could collect a list of other homonyms and use them to create their own stories once they learn how to create original text on the word processor.	
	The fourth activity "Letter From Camp" combines the language arts skills of identifying parts of speech with the word processing skills of inserting and replacing words. Using activity IV-T1-4, students complete a letter by inserting words in place of category names that are written in parentheses. The categories include parts of speech, such as nouns, adjectives, and so on.	IV-T1-4 TU

To insert or to replace new characters, words or even whole paragraphs into word processed text, the existing file must be loaded (as in Activity IV-T1-1), and the new text must be typed. While some word processing software has a special command for inserting so that existing text moves automatically to make room for the new text, others simply allow you to type in your new text overtop of the old text. To replace old text with new text, the deleting procedures (from Activity IV-T1-3) must be followed before inserting text.

LEVEL 2

At Level 2, teachers should review with students the following word processing procedures which were used during the activities provided in Level 1:

- loading the word processor program,
- accessing data files,
- manipulating the cursor,
- deleting characters and words,
- inserting and replacing characters and words.

At this point, the teachers should review the command(s) necessary for saving word processed information as a data file. Furthermore, if students are going to save word processed files on their own data diskettes, it would be advantageous to explain how to initialize or format a blank diskette as the need arises.

Once all students are familiar with the above procedures, teachers should request that students complete the activity entitled "Last Will and Testament". This activity will provide students with additional practice in inserting, deleting, replacing, composing, and saving text using word processing software.

IV-T1-5
TU

In order to provide students with an opportunity to explore the various formats of the word processor being studied, teachers are advised to show students how to transfer the contents of various files to a printer. One might consider printing Uncle Morris's Will, or the letter to Max, the butler, using the following options if they are available to your word processor. Or, if there are a limited number of printers available, teachers might wish to demonstrate the following output-formatting techniques:

- single space the output,
- double space the output,
- display the output with 40 and 65 characters across the top,
- print out the will with a top and bottom margin of 2.5 cm,
- center "Uncle Morris's Will" as a title and print it out (if possible) in bold face, italics, or underlined,
- include page numbers,
- explore different justification procedures.

Students should be encouraged to use the word processing manual whenever they wish to invoke a new process in their "creations."

In Level 2, teachers should provide opportunities where students can create original works. As a lead up to such an activity, teachers might wish to explore the possibility of writing a collective story with the class. This activity can be effectively used where there is a limited number of microcomputers available.

IV-T1-6
H-o/TU

LEVEL 3

In previous levels, students gained some experience in loading and using word processing software. It is suggested that these concepts be reviewed and reinforced by assigning some project requiring word processed output. This could be done during the computer awareness class or outside class time on a scheduled basis depending upon computer and printer availability.

Suggested activities:

* Students could produce a word processed essay report for another subject teacher. This can emphasize the value of word processing as a work saver, especially if students save a copy on diskette. The student then submits a printed copy of the essay/report to the subject teacher who makes suggestions for improvement. The student recalls the original word processed file from diskette and revises the essay/report following the subject teacher's recommendations. The corrected version may be reprinted and resubmitted with little effort. Many students will be very impressed to see their homework projects neatly typed and free of errors.

* Students could use word processing software in the production of a school newspaper or club newsletter. Items are submitted to the computer awareness class where they are word processed and assembled for photocopying or printing.

* Yearbook textual material may be word processed and printed in school if the quality of the printer is satisfactory. Layout staff would then cut and paste this material directly onto layout sheets.

* Students could use word processing software to produce enhanced print. Some software and printers are capable of generating a variety of special type styles. Some students might enjoy employing these capabilities in their assignment title pages or in classroom banners and bulletin board headers.

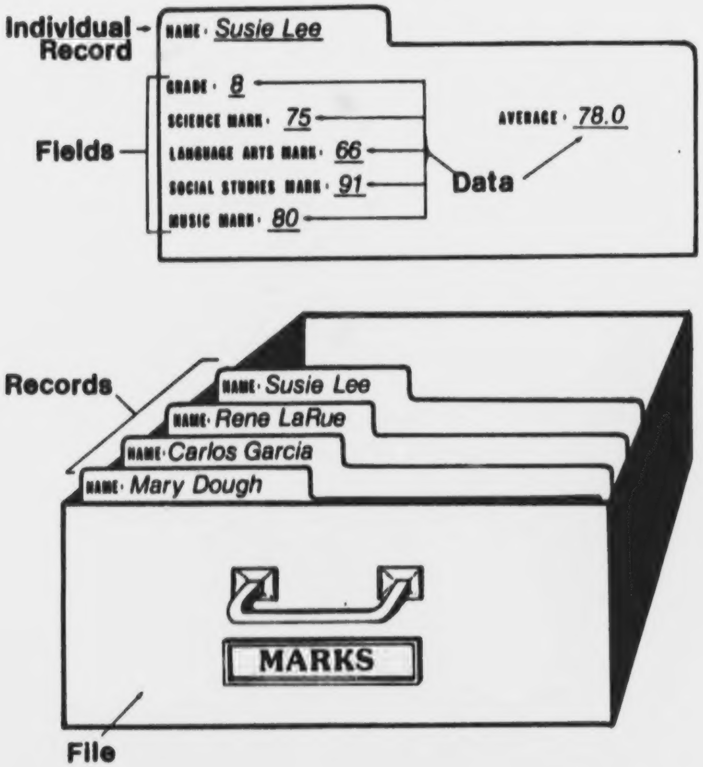
T2. to use a computer to store, to sort, and to retrieve information;
(Level 2-Introduction)
(Level 3-Expansion)

The computer software used to store, to sort, and to retrieve information is called data base management software.

Data Base Management

Data base management software is like an electronic filing cabinet or a computerized index-card box. This software lets you organize, store and retrieve information.

Parts of a Data Base


Individual Record
NAME · Susie Lee
GRADE · 8
SCIENCE MARK · 75
LANGUAGE ARTS MARK · 66
SOCIAL STUDIES MARK · 91
MUSIC MARK · 80
AVERAGE · 78.0
Fields
Data
Records
NAME · Susie Lee
NAME · Rene LaRue
NAME · Carlos Garcia
NAME · Mary Dough
MARKS
File

All data base programs contain three important elements:

1. Fields: A field is a category or item of information. For example, in a student information data base, the names of some of the fields include GRADE, SCIENCE MARK, and AVERAGE.

2. Records: A record is a collection or listing of related fields. In this student information database, the student's NAME, GRADE, various marks and AVERAGE would all be contained within each record. Similarly, the fields containing Carlos Garcia's NAME, GRADE, marks and AVERAGE would make up a record.

3. Files: A file is a collection of related records. The records of MARY DOUGH, CARLOS GARCIA, RENÉ LaRUE, SUSIE LEE and other students would make up a MARKS file on students.

All marks for a school may be stored in a file called MARKS. The teacher might then retrieve a subset of the original MARKS file made up of all records in which the data contained in the specified fields meets criteria such as:

"all students enrolled in grade 8 music" or
"all students with an average mark greater than 85%".

Left to humans, these filing, sorting and searching activities require endless, tedious hours and are subject to errors. The computer's ability to do repetitious tasks rapidly and correctly makes it an important filing tool.

Teachers should be aware that:

Activities in this section are not specific to a particular computer or data management program. The teacher must select and become familiar with the database software to be used. In addition, for Level 2, the data provided in this guide will have to be entered and stored as a file on a data diskette before the class can complete the exercises.

It is important that teachers acquire data base management software which is compatible with their microcomputers. It is recommended that teachers spend time experimenting with the database in order to become familiar with its operation and its various functions.

LEVEL 2

Level 2 provides an introduction to database management software with an emphasis on accessing data which has already been stored on a data diskette.

Students could participate in the creation of a "Fast Food" database. Teachers who feel that a "Fast Food" database would not be relevant to their students should feel free to design a database around another more appropriate classroom theme. The steps taken to illustrate the concept of a database will be the same regardless of the content of the database. Although much of the information which is supplied for the "Fast Food" database might be

IV-T2-1
TU

entered by students, teachers will need to initialize a blank data diskette, design a file "template" according to the format shown, and enter at least six entries to fully understand the structure of the sample database before presenting it to the students.

The "Fast Food" file which is included with Activity IV-T2-1 consists of records containing various food items which might be purchased from a specific fast food restaurant or store in one's neighbourhood. Each record is subdivided into a number of different fields each of which contains information regarding the nutritional content of each record (food item).

Teachers should begin by creating a data base "template" or layout format to receive the "Fast Food" information provided. Each field has a maximum number of characters which are allowed and these values should be adhered to when designing the layout of each record.

Fields	Maximum Number of Characters
Food Item	23
Chain	25
Serving Size	5
Calories	7
Protein	8
Fat	8
Carbohydrate	7
Calcium	5
Iron	9
Vitamin A	4
Vitamin C	6
Price	8

Using the database management software, teachers should create the database template illustrated below so that each complete record will fit on a single screen display.

Fast Food Database Screen Layout

Food Item: ______________________

Chain: ________________________

Serving Size (g): _____ Calories: _______

Protein (g): ________ Fat (g):________

Carbohydrate (g):_______ Calcium (mg): _____

Iron (g): _________ Vitamin A (IU): ____

Vitamin C (mg): ______ Price: ________

Once the database template has been created, each of the records from the table in activity IV-T2-1 must be entered into the data diskette. The data diskette must be completed by the teacher and/or students before the information in the database can be manipulated in the activity.

IV-T2-2
TU

IV-T2-3
H-o

Sample Fast Food Database Screen Layout

Food Item: FRENCH_FRIES___________

Chain: BURGER_KING_______________

Serving Size (g): 75___ Calories: 214____

Protein (g): 3_______ Fat (g):105_____

Carbohydrate (g):38_____ Calcium (mg): 12___

Iron (g): 1.0______ Vitamin A (IU): 0___

Vitamin C (mg): 16.0__ Price: $0.65___

After completing activities IV-T2-1, IV-T2-2 and IV-T2-3, students should have an appreciation for the speed and flexibility of a computer database in handling information.

* As an extension to these database activities, students could be encouraged to:

- discuss what is meant by a "well-balanced" diet
- research what the daily recommended intake for an average teenager is in terms of the nutritional/quantity fields identified in the database records
- determine what additional fields might be added to the database. For example, students might wish to research the sodium and/or fibre content of various foods and add such fields to the database.

LEVEL 3

The application of database management for inquiry-based learning is grounded in the cognitive learning theory of Jean Piaget. By creating a database in level 3, students follow a learning progression from concrete to symbolic to abstract. Students gather data on a given topic in a number of concrete ways. For example, they examine books, audio-visual materials, and maps or they visit art galleries, museums, and archives in order to assemble information. Students then label and group their data in a meaningful and symbolic manner in the form of the database. Finally, with analysis of the database, students are able to test hypotheses, to synthesize the pieces of data and to combine them in new and different ways. Students can then make and test more abstract generalizations about the information.

The emphasis in level 3 is on the student building their own database. The following sequence of activities is suggested:

1. Teachers should load and demonstrate the database management software which students used in level 2 , showing once again the file on which they worked.

2. Teacher-directed brainstorming should help to outline the class database on the overhead projector or blackboard. The following decisions must be made:

   . title of database or file (e.g., Provinces),
   . field items (e.g., name of province, capital city, population, area, year of entry into confederation, floral emblem),
   . number of records to develop (e.g., ten provinces plus two territories equals twelve records),
   . screen layout,
   . field lengths for records (e.g., four characters for year of entry into confederation).

3. Students should work in groups of three or four to collect data for the class database. Depending on the size and complexity of the topic, groups may work on developing different databases. Here are some possible database titles:

   . solar system
   . countries of the world
   . modern music
   . famous people
   . prime ministers
   . our class
   . our teachers
   . animals
   . birds
   . occupations
   . T.V. shows
   . books
   . movies
   . Canadian cities

It is suggested that teachers of various subjects become involved in this research. Some of the resulting databases may be useful in subjects other than computer awareness, as well as in generating an awareness of this computer facility to other teachers.

4. Each group of students will use the database management software to create on the screen an appropriate layout for inputting and displaying their researched data.

5. Each group of students should input their data.

6. A follow-up to the completed database file could involve:

   - a demonstration of accessing data from the file,
   - a printout of the entire database file.

T3. to use a computer to analyze and to predict from numeric data. (Level 3-Introduction)

The computer software used to analyze and to predict from numeric data is called electronic spreadsheet software.

Electronic Spreadsheet

An electronic spreadsheet is a computer program which allows information to be organized in tables in order to assist the user in drawing conclusions about mathematical data.

Spreadsheets are particularly helpful in the financial field since they allow the user to predict and to play "What if . . .". For example, a person using a spreadsheet to model a financial situation might be able to explore the following "What if . . ." questions:

- What effect will there be on the Canadian purchase of American manufactured computer hardware if there is a one percent change in the current Canadian-American currency exchange rate?
- What change will there be to the amount of income tax paid if a taxpayer decides to contribute $500.00 towards a Registered Retirement Savings Plan (RRSP)?
- What additional amount of money must be paid if a person wishes to purchase a home and negotiates a mortgage for 25 years rather than for 20 years?

Investors are able to get better value for their money when they utilize an electronic spreadsheet to forecast financial planning.

Students often have encountered problems which have been solved traditionally using a calculator, pencil, eraser and paper. The electronic spreadsheet simply replaces the above components with a computer for the calculator, a keyboard for the pencil, automatic recalculation for the eraser and the spreadsheet "window" on the monitor for the large sheet of paper.

Although the electronic spreadsheet is an extremely powerful tool, it requires little expertise to use. Students are first introduced to the concept of electronic spreadsheets in Level 3.

Teachers should be aware that:

The activities involved in this objective are not specific to a particular computer or electronic spreadsheet software package. However, the teacher should be familiar with the use of whatever electronic spreadsheet software is available. Possible sources of

Visicalc-type spreadsheet software include the School or School Division Administration Office, the Business Education Department, or the Manitoba Educational Technology Program (TOOLCALC).

The TOOLCALC electronic spreadsheet diskette is available from the Educational Technology Program. Teachers wishing to use TOOLCALC should obtain a copy of this diskette and make sufficient copies for each work station or each student-team in the class.

Activities and tutorials in this section have been designed to work with TOOLCALC as well as with a variety of other electronic spreadsheets. Teachers should become familiar with the rudiments of TOOLCALC or the brand of spreadsheet software to which they have access before beginning this objective with the students. In addition, it is suggested that teachers work through each of the related student activities prior to introducing the material to their students.

In the word processing and database applications covered in Levels 1 and 2, two diskettes are required. The word processing or database software resides on one diskette, while a separate diskette contains the data files created by the user. In commercial spreadsheet applications the same two-diskette system is used. However, to simplify the classroom operation involving the electronic spreadsheet, space has been left to accommodate data files, the TOOLCALC program, and the TOOLCALC tutorial on the same diskette.

As a first introduction for Level 3 students, teachers may wish to demonstrate some of the following concepts using a microcomputer connected to a large television/monitor. Teachers should load the spreadsheet program into the microcomputer, then student volunteers enter the commands while the rest of the class views the results. In this way, the teacher can demonstrate many of the initial techniques for moving the cursor about the spreadsheet.

In this initial exposure to the electronic spreadsheet, the following concepts should be covered:

- Cell locations and names
- Size of the spreadsheet in terms of rows and columns
- Moving the cursor about the spreadsheet
- Loading a stored template from the diskette catalogue
- Moving to a specific cell using the GOTO command
- Clearing the contents of a spreadsheet
- Modifying the cell width
- Entering data into a spreadsheet as a label, a value, or a formula
- Saving information on a spreadsheet
- Printing spreadsheet information

Teachers should refer to Activities IV-T3-1 to IV-T3-6 for brief tutorials on TOOLCALC.

IV-T3-1
H-o

Once students are familiar with the spreadsheet layout, can move the cursor, and can locate the contents of any cell, teachers should provide information as to the process necessary for loading a spreadsheet template containing pre-recorded data.

Teachers should prepare a template called CARTOON which saves a series of words in individual cells which must be set to accommodate 12 characters in width. Students should then load the CARTOON template into their electronic spreadsheet and complete the related Activity IV-T3-2.

IV-T3-2
H-o/TU

Teachers should encourage students to review the spreadsheet tutorial which refers to the process for changing the cell width and clearing the entire spreadsheet. Ask students to reload the CARTOON template, if necessary, and to determine the width of each cell by counting characters and spaces. Students should agree that the CARTOON cell width has been set to 12. Have students modify the cell width of the CARTOON template to 6 and ask them to observe and discuss what happens. If the CARTOON cell width is expanded to 9 characters without reloading the CARTOON template, do the truncated characters which were lost reappear?

Teachers should have all students clear the entire spreadsheet using the CLEAR option on the extended command menu.

Students should explore the use of the GOTO function as indicated in the TOOLCALC tutorial. Although students may wish to use the arrow keys to search out the contents of individual cells, the GOTO function will speed up this process particularly on extremely large electronic spreadsheets. Students should load the template/file called PUZZLE and decode the message in the activity.

IV-T3-3
H-o

Until now, students have been accessing information which has already been loaded into templates or files. At this point, students should have an opportunity to experiment and learn how to make their own entries. It is important that teachers stress that entries in an electronic spreadsheet can be of the following three formats:

- . Values or numbers such as 12, 1.414
- . Arithmetic expressions or formulae based on cell locations such as 2.54*B3, J4/3.14

. Labels tend to be entries which cannot be interpreted as either a value or an expression. Generally labels, as the name implies, are used to identify the contents of various rows, columns or cells of an electronic spreadsheet. Labels might include APRIL, TAX, FINAL MARK.

Students should be encouraged to review the TOOLCALC tutorial which refers to the way in which data is entered into a spreadsheet.

IV-T3-4
H-o

It is important that students review the TOOLCALC tutorial in order to learn the process for saving a data file using an electronic spreadsheet. It should be stressed that students may save data on file any time they wish and that it is not necessary to complete the entire spreadsheet activity before data can be saved. This fact is extremely important since students may need to save partially completed activities or assignments at the end of class periods in order that these files can be retrieved later.

Once students are familiar with the concepts of changing cell width, entering information, saving and retrieving electronic spreadsheet files, they might enjoy making up their own coded messages similar to the one called CARTOON used in Activity IV-T3-2 and challenging their friends to decode their messages hidden within the spreadsheet cell locations.

Students could load the spreadsheet with a paragraph that uses the coded words which are scattered throughout the "story." It is important that students set the width of all cells to one space more than the number of characters in the longest word in the story. The final story template should be saved on diskette. Have students exchange coded messages (e.g., A4 B6 C5 D7, etc.), together with the corresponding story templates, to see if they can decode the secret message.

As students become more familiar with electronic spreadsheets and begin using expressions which have more than one operation sign it is extremely important that teachers stress how expressions are evaluated in an electronic spreadsheet.

In an electronic spreadsheet, arithmetic expressions are always evaluated strictly from left to right and if 2+3*7 is entered as an expression, the spreadsheet cell would be assigned a value of 35. If the user wished the expression to be evaluated as 23 then it could be entered as 3*7+2. An alternative possibility would be to use brackets to force an operation to be calculated first if your electronic spreadsheet has such a capability. Thus, an expression entered as 2+(3*7) would assign a value of 23 to the appropriate cell.

IV-T3-5
H-o

Students should be encouraged to enter various values and expressions and to explore the cause and effect relationship which exists between various cells in an electronic spreadsheet. Only through such guided exploration do students become more aware and appreciative of the electronic spreadsheet's capabilities.

IV-T3-6
H-o

* Teachers should explore the capabilities of their electronic spreadsheet and if possible demonstrate to students how the contents of certain areas of an electronic spreadsheet can be printed on paper. This will facilitate making assignments if teachers wish to have the spreadsheet results submitted for verification as part of an activity.

Once students have become familiar with the concept of the electronic spreadsheet, they should be encouraged to apply that knowledge to a real-life problem. Activity IV-T3-7 guides the student through the stages of problem-solving using an electronic spreadsheet to plan the floor coverings for a new house within a specified budget.

Teachers can extend and enhance this activity by having students design their own floor plans, measure an existing house instead of using plans, shop for and bring back actual samples and prices of floor coverings, consider that in the real world no baseboard is needed at doorways, or include other decorating variables such as wallpaper or paint. The problem could be made even more realistic by having the measurements from the plan entered directly into the spreadsheet with the scale conversions (1 cm = 0.5 m) as part of the spreadsheet calculations rather than being done separately.

The teacher should begin by having students complete Activity IV-T3-7. Emphasis should be placed on their completing the steps of the problem so students obtain a chart similar to the following:

IV-T3-7
H-o

1.	length		6 m
2.	width		4 m
3.	carpet price		$\$29/m^2$
4.	baseboard price		$3.25/m
5.	area	6x4	$24m^2$
6.	perimeter	6+4+6+4	20 m
7.	carpet cost	24 x 29	$696
8.	baseboard cost	20 x 3.25	$ 65
9.	total cost	696 + 65	$761

Before using the spreadsheet program in Activity IV-T3-7, the teacher may prefer to have students solve some of the problems without computer aid in an attempt to show the ease by which such problems can be solved using an electronic spreadsheet.

The teacher should now load the spreadsheet program (or have students do so) and direct them through the process of inserting the data for the problem (Activity IV-T3-7) into the spreadsheet. The chart below, on the left, shows the actual information which should be typed at each cell. The chart on the right shows the results as they will appear on the screen. Notice, that words have been abbreviated to fit into available space.

	A	B
1	LENGTH	6
2	WIDTH	4
3	C PRICE	29
4	BB PRICE	3.25
5	AREA	B1*B2
6	PERIMETER	B1+B2+B1+B2
7	C COST	B5*B3
8	BB COST	B6*B4
9	TOTAL	B7+B8

	A	B
1	LENGTH	6
2	WIDTH	4
3	C PRICE	29
4	BB PRICE	3.25
5	AREA	24
6	PERIMETER	20
7	C COST	696
8	BB COST	65
9	TOTAL	761

As students are inserting data, it will be necessary to emphasize the three different types of cell information:

- labels (LENGTH, WIDTH, AREA)
- numbers (6, 4, 3.25)
- formulas or expressions (B1*B2, B7+B8)

Various spreadsheets use different conventions for signalling each type of data to the computer.

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
	Once students have successfully entered the spreadsheet data, the following procedure could be used to show the power of a spreadsheet.	
	Move the cursor to cell B1 and enter a new length of 10.	
	Students should notice that all length-dependent cell values have changed automatically (area, perimeter, carpet cost, baseboard cost, and total cost).	
	Activity IV-T3-8 consists of additional problems which are based on the carpet/baseboard spreadsheet solution.	IV-T3-8 H-o

V. COMPUTERS IN OUR LIVES 20%

The recent technological explosion has brought individuals into daily contact with computers in their workplace, schools, and homes. Therefore, students should become increasingly aware of the advantages, limitations, uses, and implications of this computer technology. This unit is designed to expose students to basic applications and corresponding implications of computer use through a series of classroom activities and simulations.

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
The student should be able:		
1. to identify common devices which use computer technology in the school and in the home; (Level 1-Introduction)	The following are examples of common devices using computer technology: Intellivision/Atari video games, Little Professor, Simon, Speak and Spell, Speak and Read, Big Trak, microwave oven, video cassette recorder, calculator, organ, automobile, electronic sewing machine, electronic coffee maker, and clock radio. Teachers could encourage students to collect electronic devices for display. Some of these devices could be taken apart.	
2. to discuss how computers are used in the community; (Level 1-Introduction) (Level 2-Expansion)	Some areas where computers may be used in the community include travel agencies, restaurants, business offices, banks, police stations, supermarkets, hospitals, medical centres, printing offices, airports, weather bureaus, railways, agricultural offices, and utility companies. Plan field trips, invite representatives from the community to speak to the class or show relevant films/video tapes. Resource: 1. "Caught in the Middle" - computer use in and around Winnipeg. Video format, available from the Manitoba Education Library. * Schools could produce a slide or video program outlining computer use in the local area.	V-2-1 LA

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
3. to describe how computers are related to leisure time activities; (Level 1-Introduction) (Level 2-Expansion)	Research the use of computer technology in music, art, theatre, film production, choreography, animation, sports, and television. Resources: 1. Fast Forward I - video tape - "Music" 2. Fast Forward II - video tape - "State of the Arts" 3. Bits and Bytes - video tapes - "Computer Music" and "Computer Graphics"	
4. to identify computer-related careers; (Level 3-Introduction)	Possible computer careers include: . Programmer . Computer Operator . Computer Educator . Computer Technician . Data Entry Clerk . Systems Analyst * Research information on a career in computers. Students may use newspaper advertisements or interview techniques to obtain information on the following: . Educational background required . Job description . Salary range . Job openings . Opportunities for advancement * The teacher may wish to involve the guidance counsellor in a presentation to the class in demonstrating CHOICES (Computer Career Search).	

Resource:

1. Jobs in Data Processing, Coronet Instructional Media, 1974 - Manitoba Education Library (Kit).

5. to assess possible negative consequences of the application of computers in society;
(Level 3-Introduction)

Teachers could ask students to make a list of information that may be stored in a data bank. Some examples of information that may be stored include driving record, tax record, banking record, credit rating, medical record, as well as flight and accommodation availability.

In discussing/researching the possible negative consequences of computers, students could consider the following topics:

. invasion of privacy
. computer crime
. possible job displacement
. depersonalization (being treated as a number)

* For one view regarding privacy and the creation of a national data bank, students could read the play "The Day the Computers Got Waldon Ashenfelter" by Bob Elliott and Ray Goulding found in The Compleat Computer by Dennie Van Tassel.

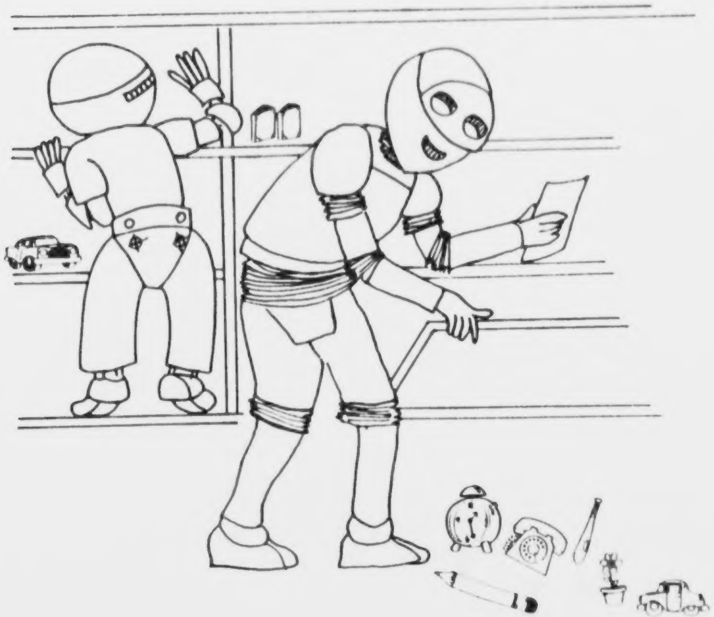
* Teachers should encourage students to discuss the implications of a "cashless society" with respect to the following points:

  . What is meant by a cashless society?
  . Describe how life in a cashless society may become easier?

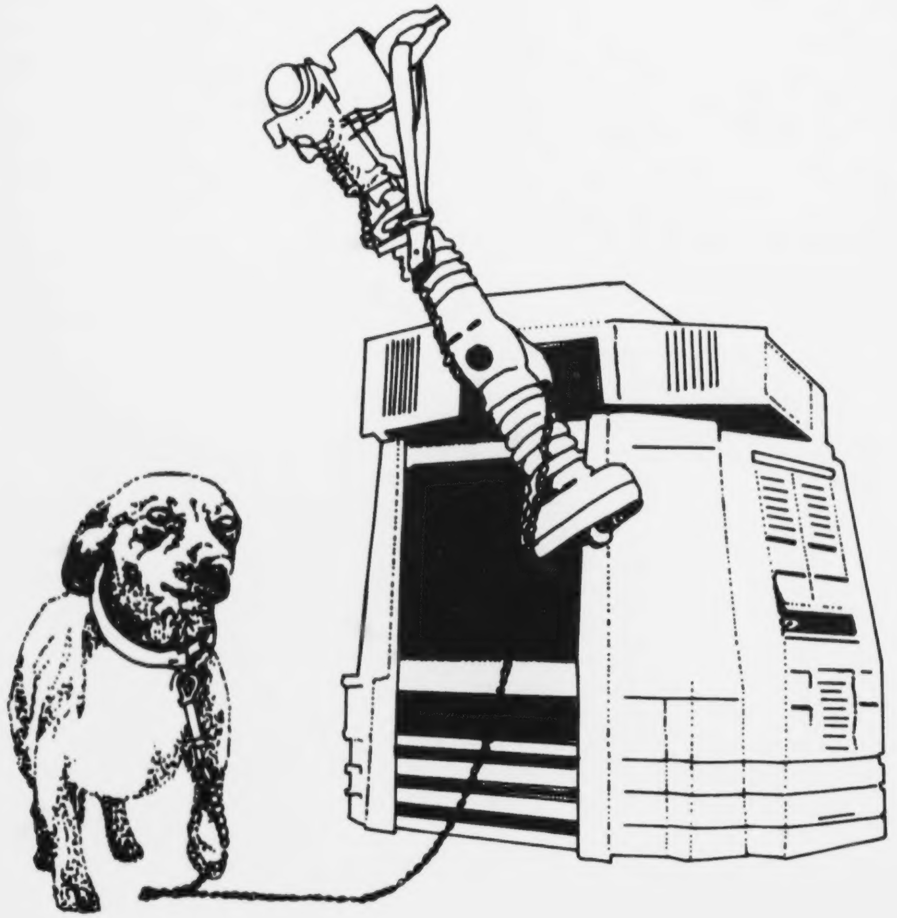
OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
	. Describe how the computer could remove the need for us to carry cash? . What are some disadvantages to having an electronic money system? . Are you personally in favour of a cashless society?	
6. to debate the advantages and limitations of computers; (Level 2-Introduction) (Level 3-Expansion)	Computers cannot think, judge, or feel emotions but on the other hand, computers are fast, accurate, do repetitive tasks, and work in dangerous situations without jeopardizing human life. Activity V-6-1 can serve as a record sheet for identifying what computers can and cannot do. Suggested activities: * Students could determine and discuss whether computers or humans can best accomplish the following tasks: see, sort, hear, taste, suffer, love, observe, write, enjoy, compare, predict, forget, smell, create, recite, invent, judge, rearrange, classify, compose, remember, identify, feel, imagine, guess, match, estimate, compute, recognize, alphabetize, describe, calculate, and choose. * Encourage students to make a list of areas in society that use computers. Teams of two students could research the advantages and the limitations of computer use. * Have students research and discuss robotics and bionics emphasizing: . advantages . limitations . future development	V-6-1 LA

OBJECTIVES	NOTES AND EXPLANATIONS	ACTIVITIES
	* Have students complete the "Opinionnaire" found in Activity V-6-2. Later students could take the opinnionaire home for an adult to complete. After tabulating results, the class could compare and contrast their results with those of the adults.	V-6-2 LA/Ma/Sc
7. to predict how computers might be used in the future. (Level 2-Introduction) (Level 3-Expansion)	Suggested activities: * Draw cartoons about computers and/or robots depicting: . how students feel about computers, . how computers may affect our lives, . possible computer uses in the future. * Write alternate captions for computer related cartoons. * Write a futuristic short story, "The Computer and Me in 2003." * Write limericks or poems which suggest how a computer might be used in the future. * Read books and stories about robots. (Some authors include Isaac Asimov, Ray Bradbury, Robert Heinlein, and Arthur Clarke.) * Students could be assigned one of the following projects: . build or draw a robot. Compare android and mechanical features. . describe some of the things that robots do in industry. Which of these jobs are boring or dangerous? . predict what jobs robots will do in the home in the future. . discuss the characteristics of robots on television or in films.	

101 Activities for Computer Classes from the Minnesota Educational Computing Corporation contains sections entitled "Computers in Society," "The Computer Industry," and "Just for Fun" which provide numerous one-page activity "handouts."



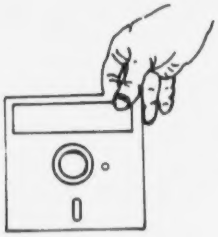
activities



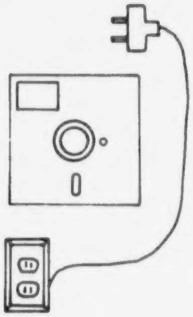
DISKETTE
DO'S and DON'TS

I-1-1
Level 1
TU
P.1 of 2

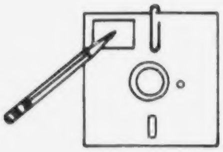
Handling Precautions To Protect Against Possible Failure



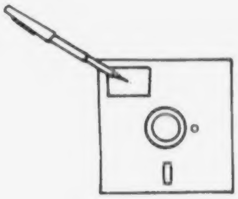
HANDLE DISKETTE BY LABEL



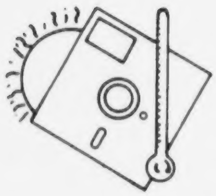
KEEP AWAY FROM
ELECTRICITY SOURCES



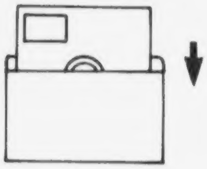
NO PENCILS, NO CLIPS,
BALLPOINTS



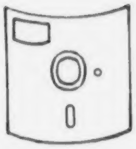
FELT TIP ONLY



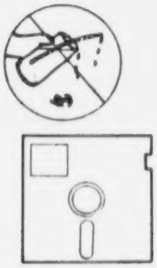
NO SUN, NOT TOO HOT



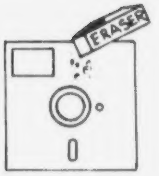
PLACE DISKETTE IN JACKET



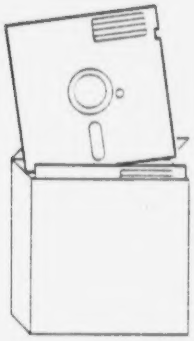
DON'T BEND



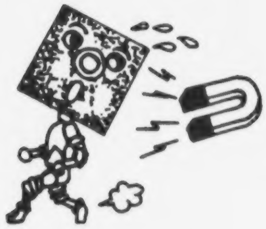
NO FOOD OR DRINK



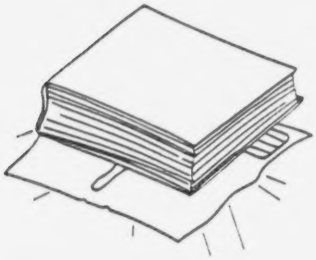
DON'T USE ERASERS



STORE VERTICALLY



AVOID MAGNETS



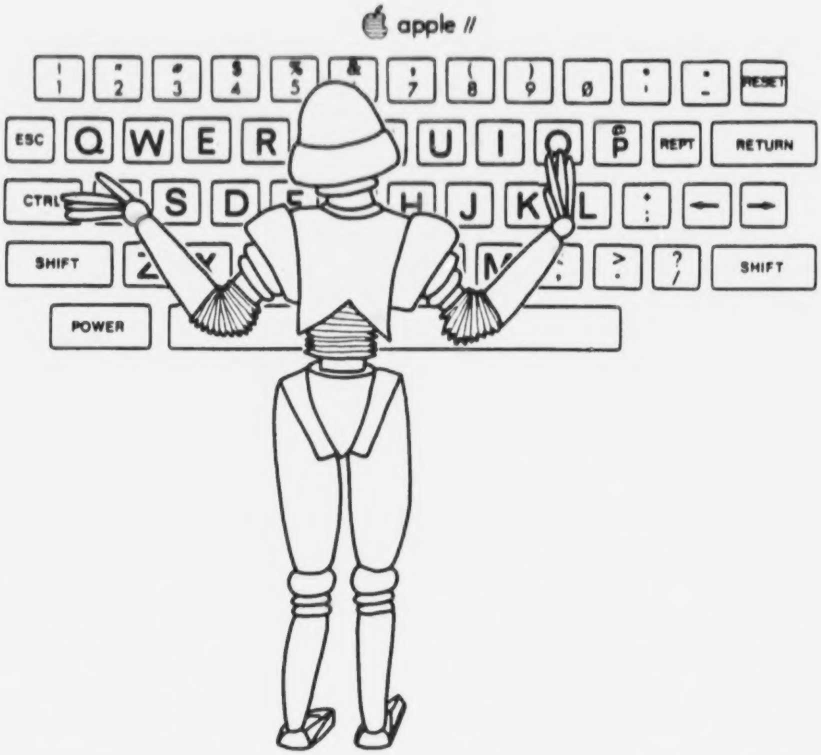
NO HEAVY OBJECTS
ON DISKETTES

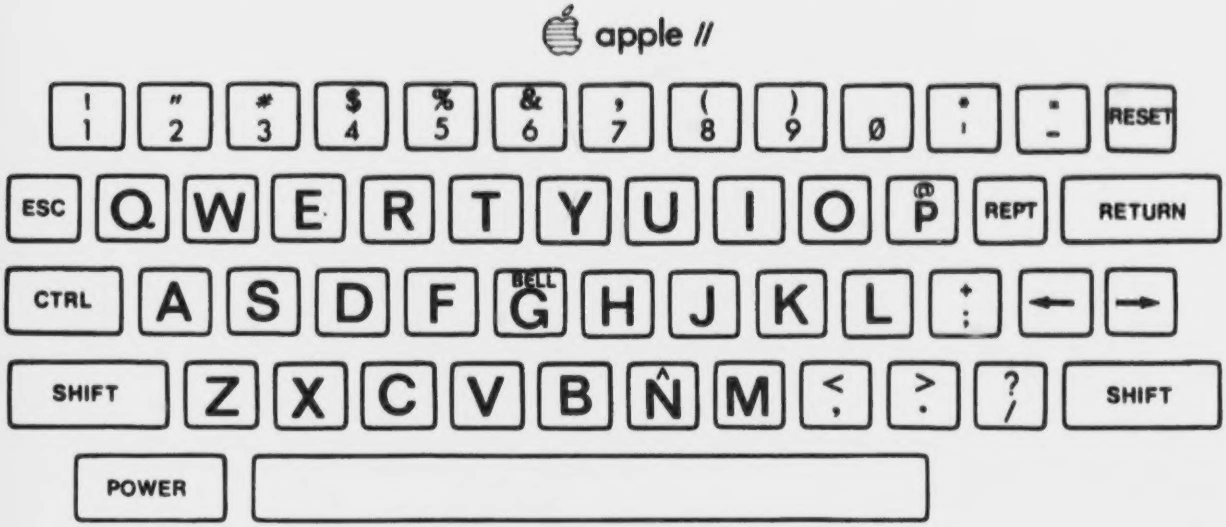
"KEYING IN"

I-4-1
Levels 1,2,3
TU
P.1 of 6

DIRECTIONS:

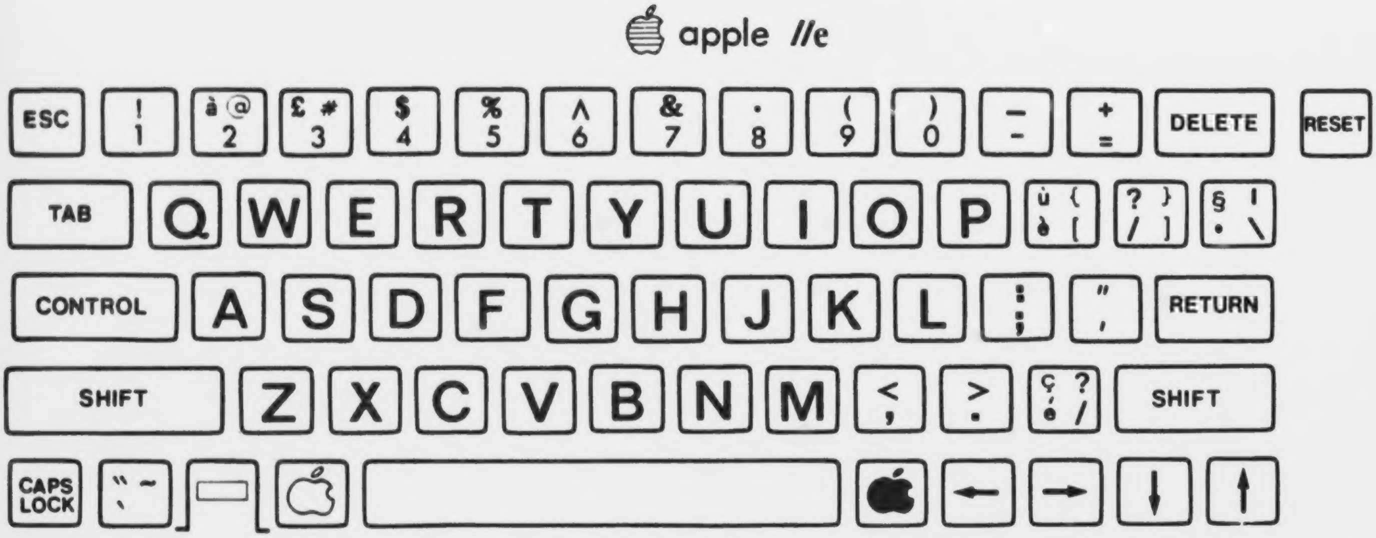
1. The teacher may wish to reproduce and to distribute the appropriate keyboard diagram to the class prior to demonstrating the use of all the keys on the microcomputer keyboard.
2. Students could be encouraged to identify and to label all of the special function keys.


apple //
RESET
ESC
Q
W
E
R
U
I
O
P
REPT
RETURN
CTRL
S
D
H
J
K
L
SHIFT
Z
M
SHIFT
POWER



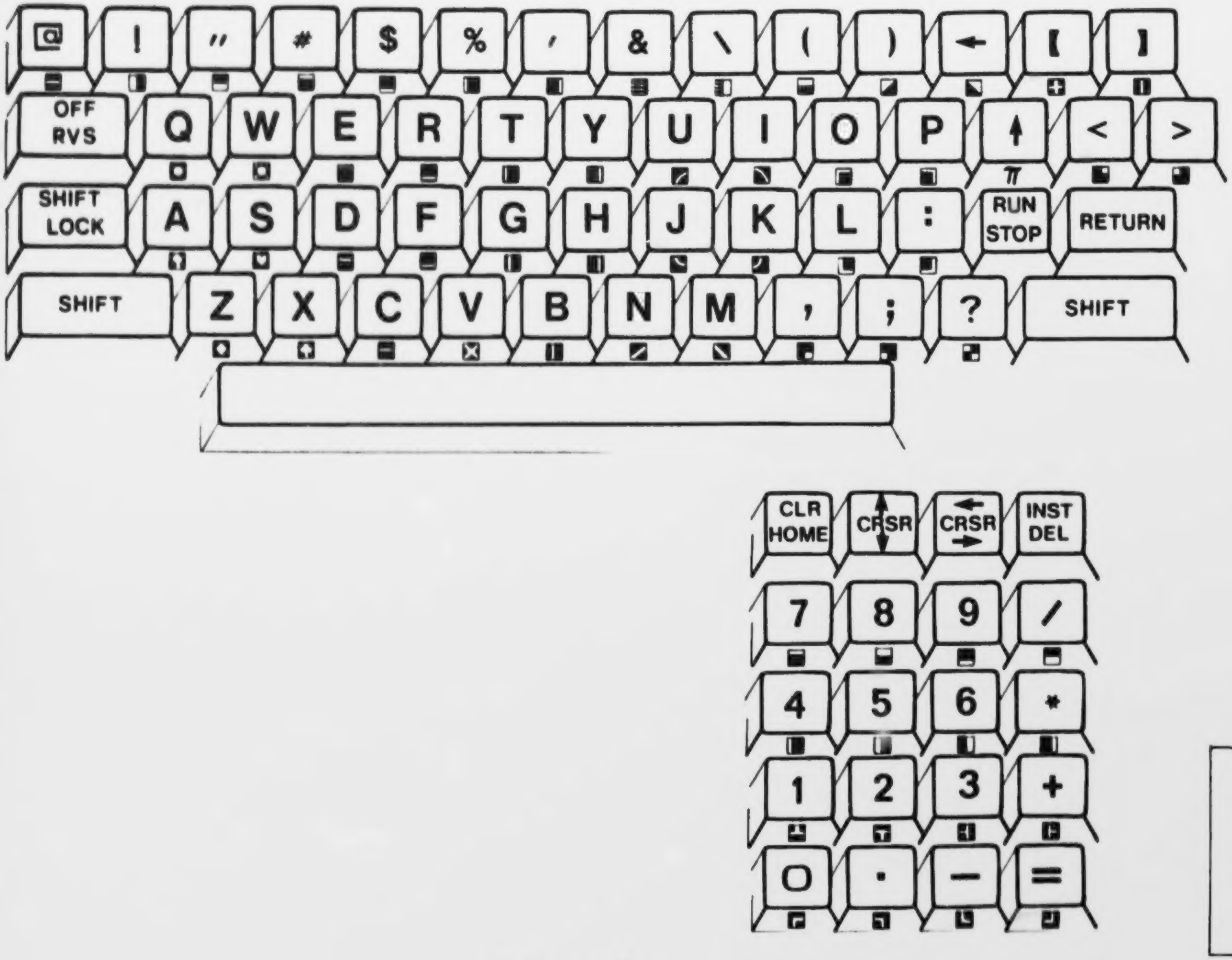
apple //
! 1
" 2
# 3
$ 4
% 5
& 6
' 7
(8
) 9
0
* :
= -
RESET
ESC
Q
W
E
R
T
Y
U
I
O
@ P
REPT
RETURN
CTRL
A
S
D
F
BELL G
H
J
K
L
+ ;
←
→
SHIFT
Z
X
C
V
B
^ N
M
< ,
> .
? /
SHIFT
POWER

1-4-1
Levels 1,2,3
TU
P.2 of 6


apple //e
ESC
! 1
à @ 2
£ # 3
$ 4
% 5
^ 6
& 7
* 8
(9
) 0
— -
+ =
DELETE
RESET
TAB
Q W E R T Y U I O P
ù { à [
? } /]
§ ! • \
CONTROL
A S D F G H J K L
: ;
" '
RETURN
SHIFT
Z X C V B N M
< ,
> .
ç ? é /
SHIFT
CAPS LOCK
" ~ `

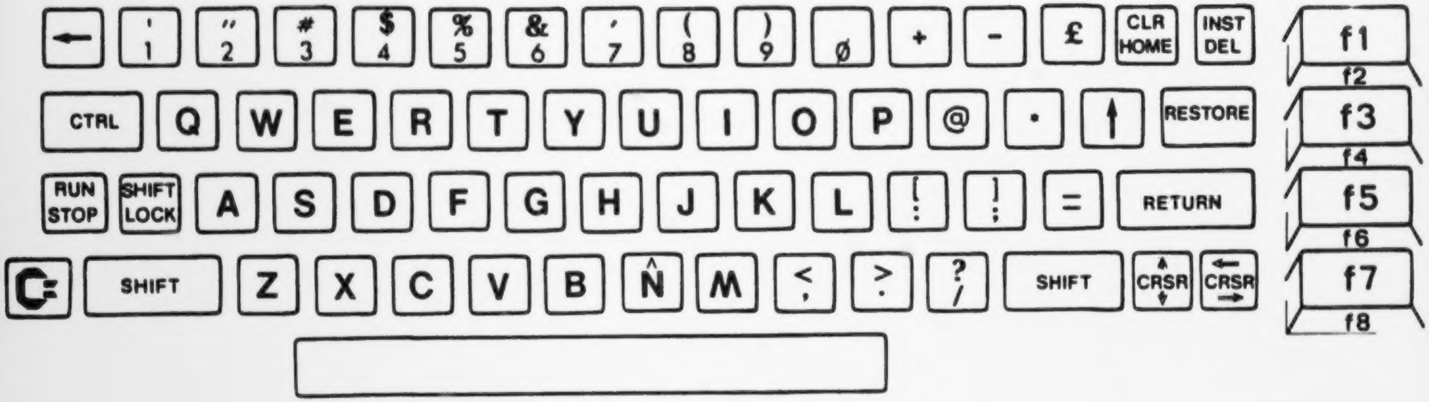
I-4-1
Levels 1,2,3
TU
P.3 of 6

PET COMMODORE Models 4016 & 4032


@ ! " # $ % ' & \ ( ) ← [ ]
OFF RVS
Q W E R T Y U I O P ↑ < >
π
SHIFT LOCK
A S D F G H J K L :
RUN STOP
RETURN
SHIFT
Z X C V B N M , ; ?
SHIFT
CLR HOME
CRSR
CRSR
INST DEL
7 8 9 /
4 5 6 *
1 2 3 +
0 . – =

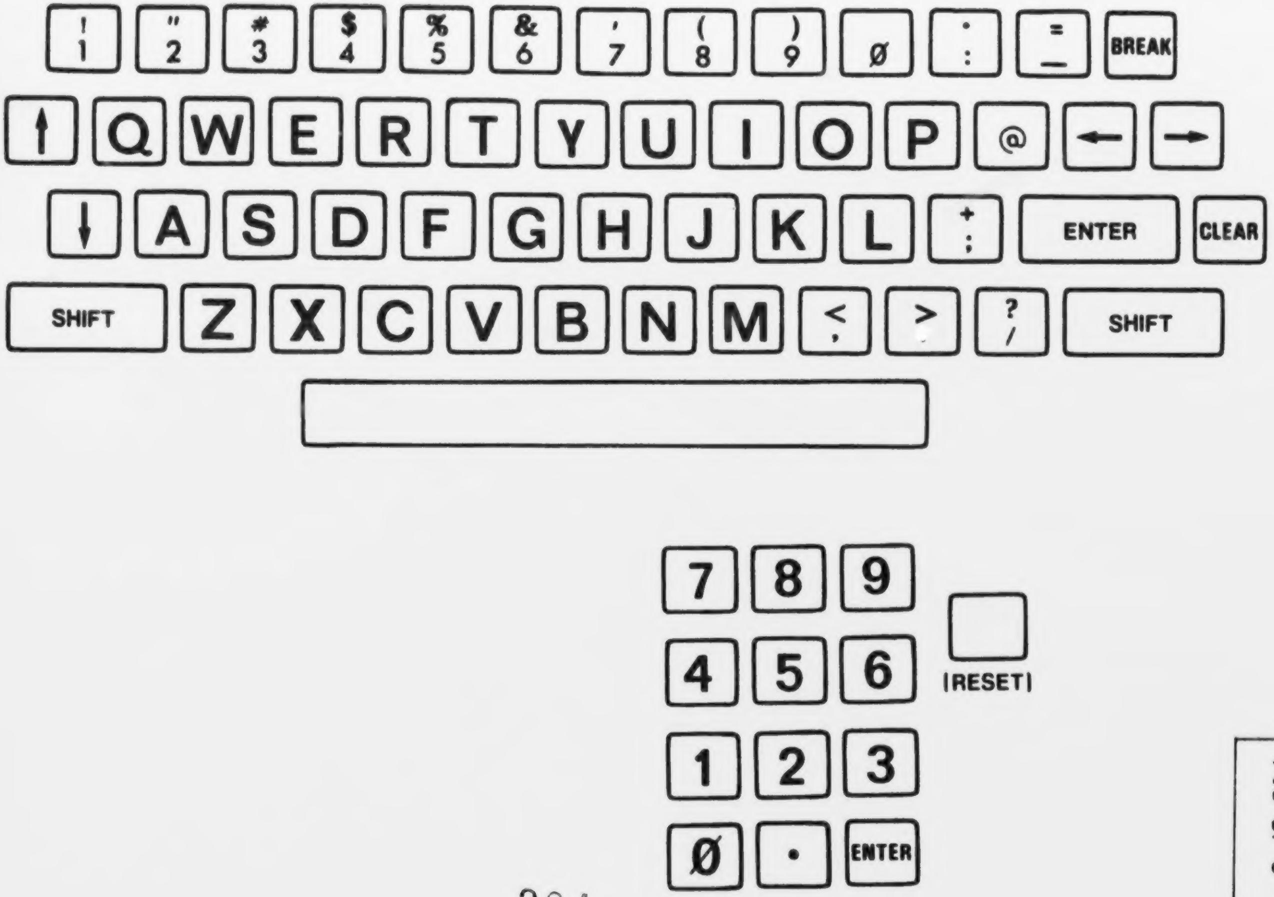
I-4-1
Levels 1,2,3
TU
P.4 of 6

COMMODORE 64 and VIC 20


← ! 1 " 2 # 3 $ 4 % 5 & 6 ' 7 (8) 9 0 + - £ CLR HOME INST DEL
CTRL Q W E R T Y U I O P @ * ↑ RESTORE
RUN STOP SHIFT LOCK A S D F G H J K L [:] ; = RETURN
SHIFT Z X C V B N M < , > . ? / SHIFT CRSR CRSR
f1 f2 f3 f4 f5 f6 f7 f8

I-4-1
Levels 1,2,3
TU
P.5 of 6

TRS-80 MODEL III


! 1
" 2
# 3
$ 4
% 5
& 6
' 7
(8
) 9
0
* :
= _
BREAK
↑
Q
W
E
R
T
Y
U
I
O
P
@
←
→
↓
A
S
D
F
G
H
J
K
L
+ ;
ENTER
CLEAR
SHIFT
Z
X
C
V
B
N
M
< ,
> .
? /
SHIFT
7
8
9
4
5
6
1
2
3
0
.
ENTER
(RESET)

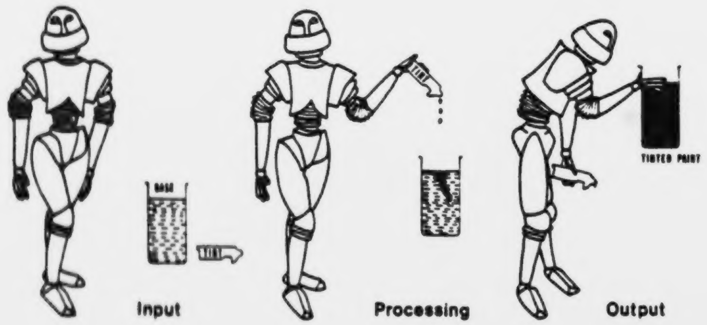
I-4-1
Levels 1,2,3
TU
P.6 of 6

INPUT, PROCESSING, OUTPUT

II-1-1
Level 1
Sc
P.1 of 3

DIRECTIONS:

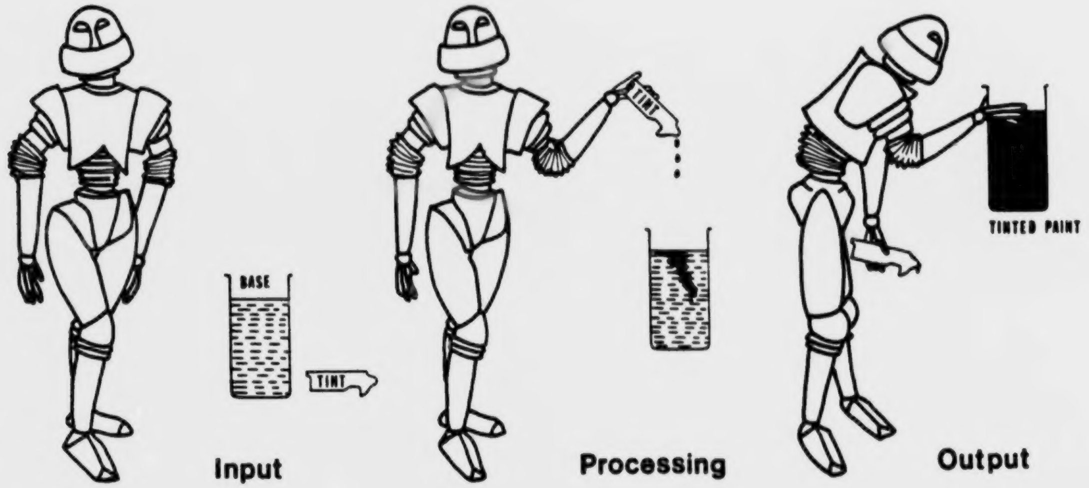
Many everyday activities provide examples of input, process, and output. Consider the example of tinting paint shown in the first row of the following chart. Complete the chart.


BASE
TINT
Input
Processing
TINTED PAINT
Output

	ACTIVITY	INPUT	PROCESSING	OUTPUT
Example	*Tinting Paint*	*Tint and Paint Base*	*Mixing*	*Tinted Paint*
1				clean dishes
2	making ice			
3			baking	
4	using a vending machine			

II-1-1
Level 1
Sc
P.2 of 3

	ACTIVITY	INPUT	PROCESSING	OUTPUT
5		baseball and bat		
6	planting a garden			
7				bird house
8			banking machine withdraws money from user's account	
9		original and photocopier		


BASE
TINT
Input
TINT
Processing
TINTED PAINT
Output

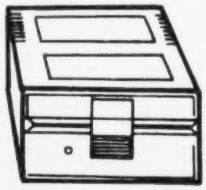
	ACTIVITY	INPUT	PROCESSING	OUTPUT
Example	*Tinting Paint*	*Tint and Paint Base*	*Mixing*	*Tinted Paint*
1	washing dishes	dirty dishes, soap, and water	washing	clean dishes
2	making ice	water and cold temperature	freezing	ice
3	baking cookies	raw dough	baking	cookies
4	using a vending machine	coins	machine checking amount of money and ejecting product	product
5	batting a ball	baseball and bat	swinging	hit or miss
6	planting a garden	earth, seeds, water, sunlight	growing	vegetables
7	building a birdhouse	wood,nails, paint,tools	measuring, sawing, hammering, glueing, painting	bird house
8	withdrawing cash from an automatic banking machine	bankcard, valid I.D. number, instructions	banking machine withdraws money from user's account	cash
9	using a photocopier	original and photocopier	machine makes a copy	photocopy

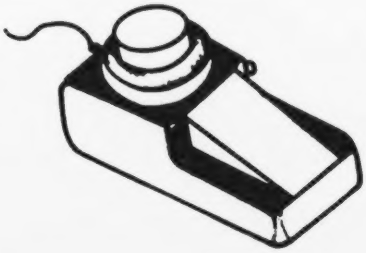
HARDWARE CLASSIFICATION

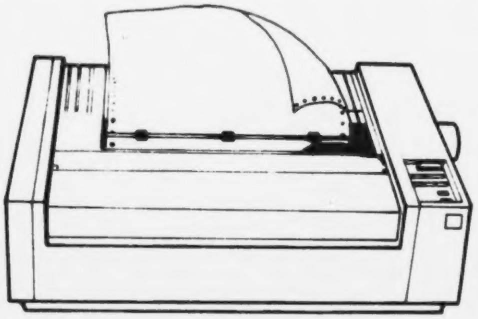
II-3-1
Level 2
LA/Sc
P.1 of 4

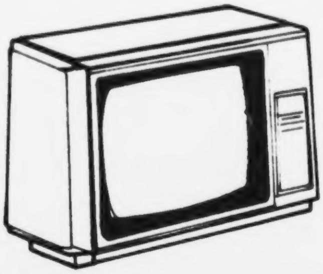
DIRECTIONS:

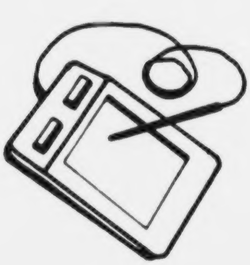
1. Write the name of each piece of hardware beneath its picture.
2. Classify each device as input, output or input/output by listing its name on the chart on page 2.

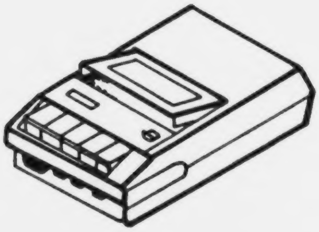




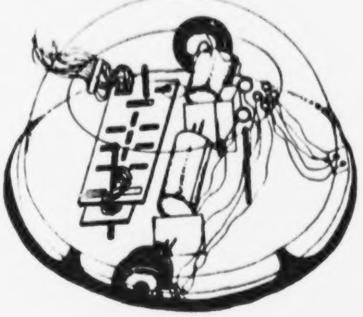


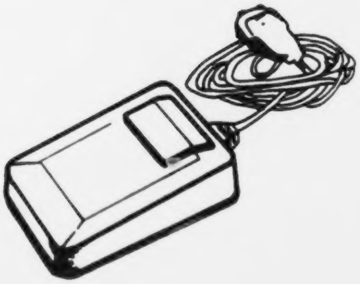


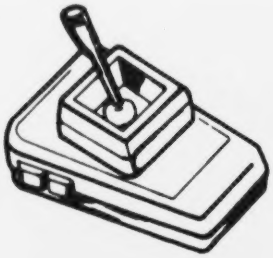


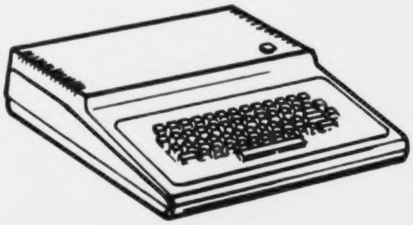


II-3-1
Level 2
LA/Sc
P.2 of 4







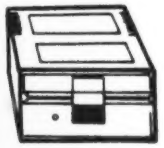


HARDWARE CLASSIFICATION

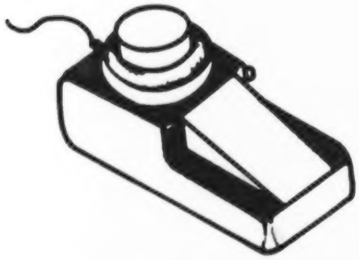
INPUT DEVICES	OUTPUT DEVICES	INPUT/OUTPUT DEVICES

ANSWER KEY
FOR
"HARDWARE CLASSIFICATION"

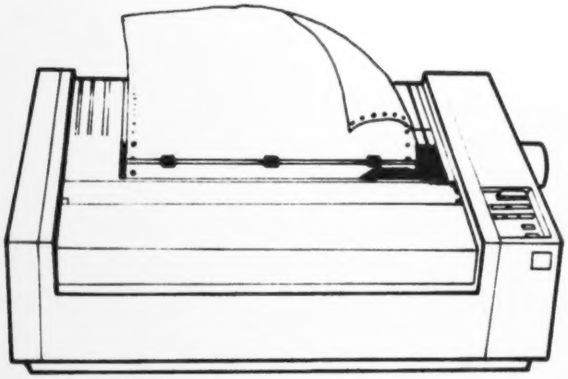
II-3-1
Level 2
LA/Sc
P.3 of 4



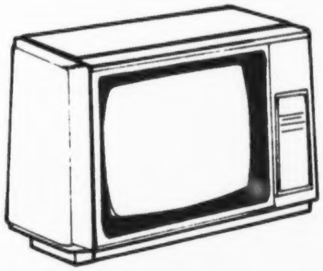
disk drive



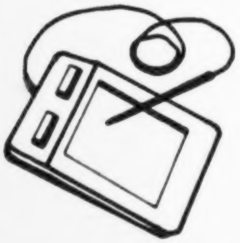
game paddle



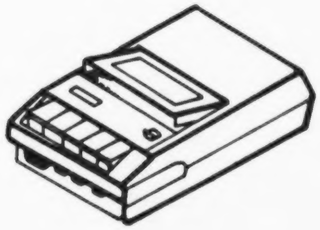
printer



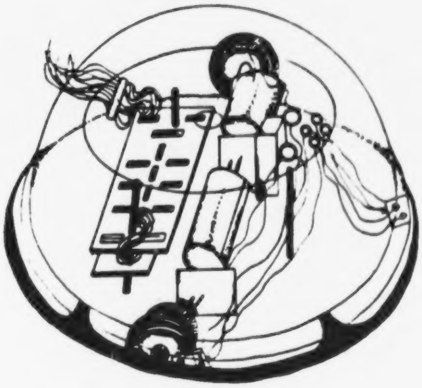
monitor



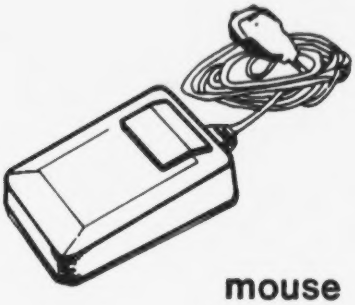
graphics tablet



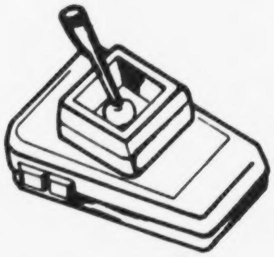
cassette recorder



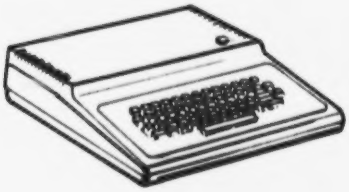
robot



mouse



joystick



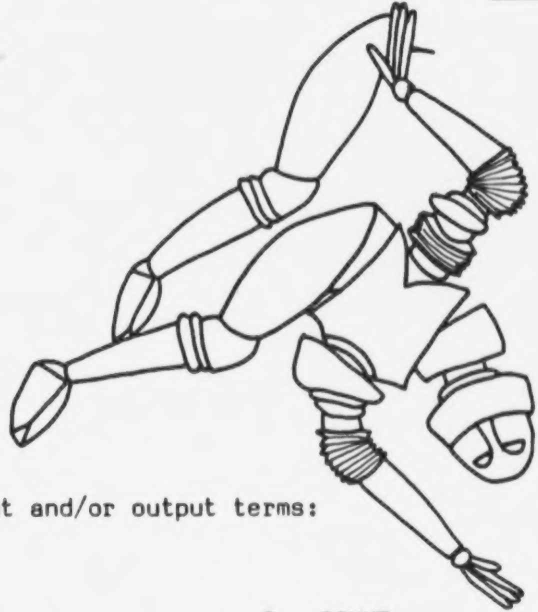
keyboard

HARDWARE CLASSIFICATION

INPUT DEVICES	OUTPUT DEVICES	INPUT/OUTPUT DEVICES
game paddle joystick keyboard mouse graphics tablet	printer monitor robot	disk drive cassette recorder

"AMBLESCRAY"

II-3-2
Level 2
LA
P.1 of 2



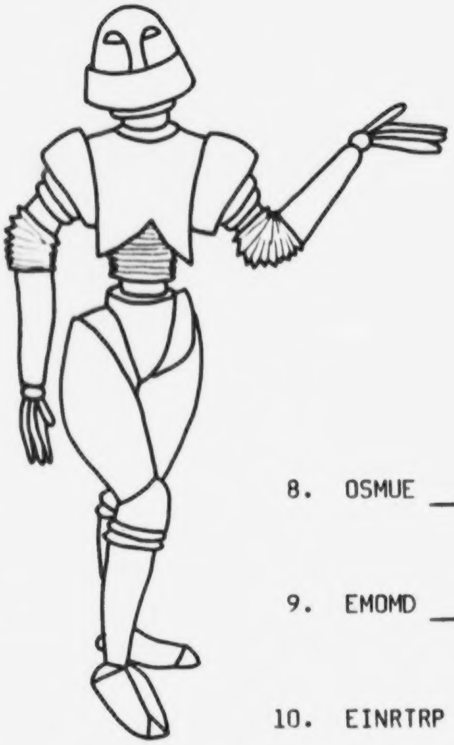
DIRECTIONS:

Unscramble the following input and/or output terms:

1. UPTIN ________________
2. TTUUPO ________________
3. PUC ________________
4. PERDAACRED ________________
5. IKDSTETE ________________
6. CAESTSET ________________
7. AGMCTNIE ________________
8. OSMUE ________________
9. EMOND ________________
10. EINRTRP ________________
11. LHP ETNIG ________________
12. POTRETL ________________
13. OMRETCUP ________________
14. TYSOJKCI ________________

ANSWER KEY FOR "AMBLESCRAY"

II-3-2
Level 2
LA
P.2 of 2



1. UPTIN INPUT

2. TTUUPO OUTPUT

3. PUC CPU

4. PERDAACRED CARD READER

5. IKDSTETE DISKETTE

6. CAESTSET CASSETTE

7. AGMCTNIE MAGNETIC

8. OSMUE MOUSE

9. EMOMD MODEM

10. EINRTRP PRINTER

11. LHP ETNIG LIGHT PEN

12. POTRETL PLOTTER

13. OMRETCUP COMPUTER

14. TYSOJKCI JOYSTICK

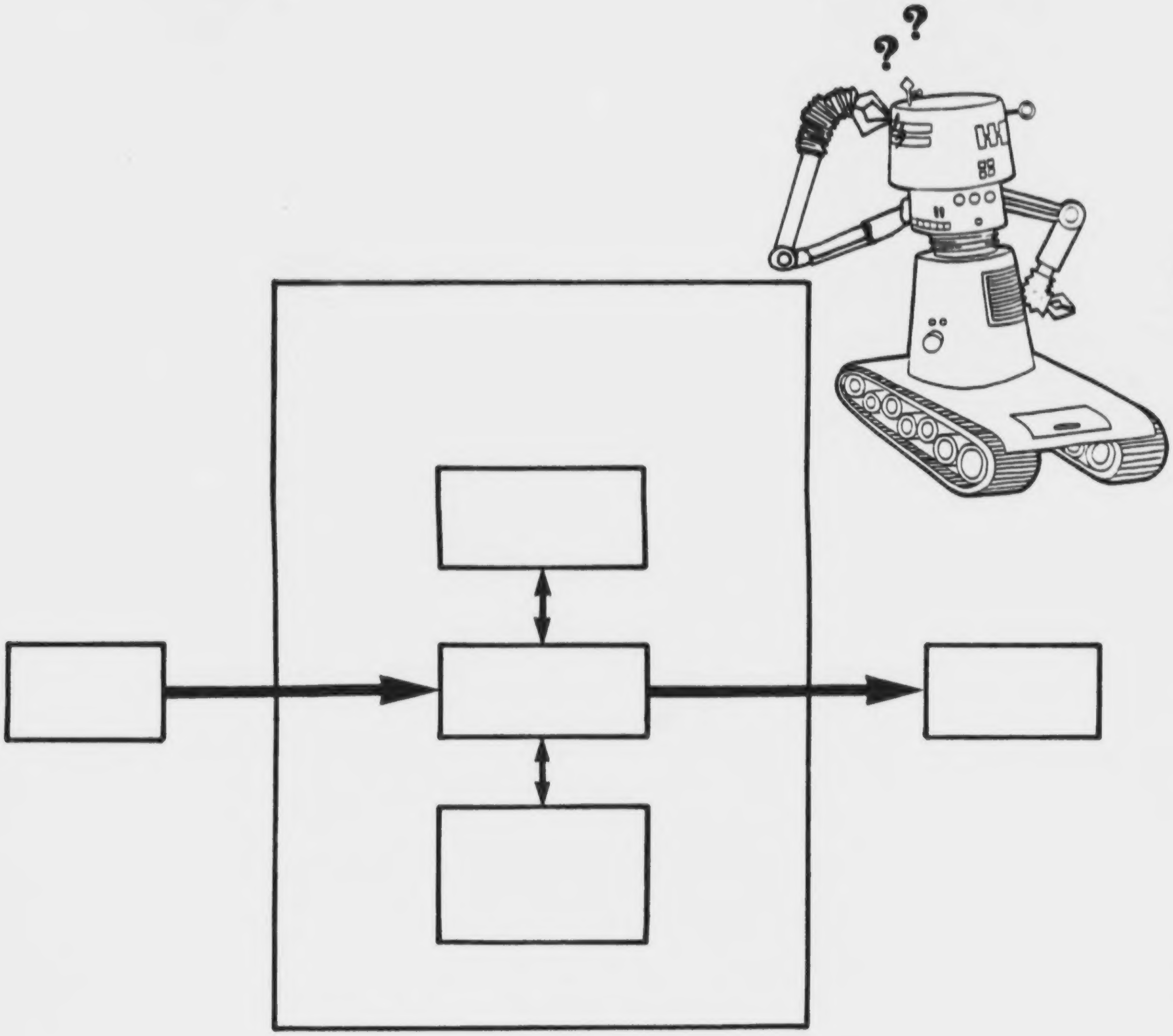
A COMPUTER MODEL

II-4-1
Level 3
Sc
P.1 of 2

DIRECTIONS:

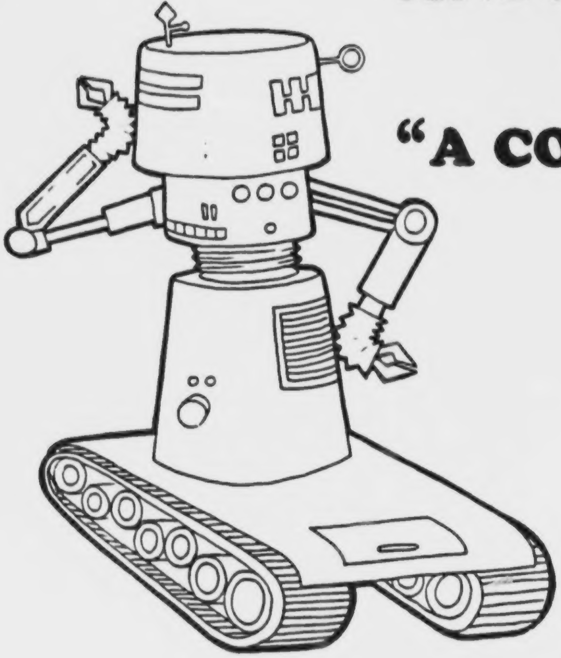
Place the following terms in the correct place in the computer model shown below.

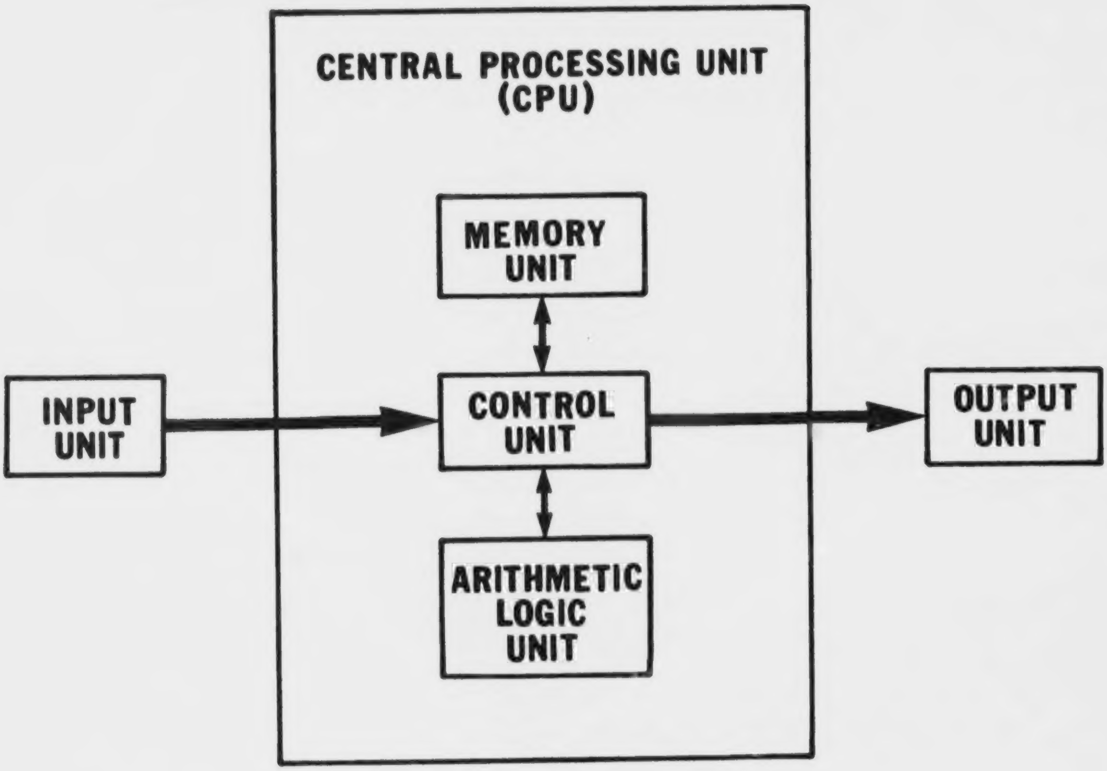
(1) ARITHMETIC LOGIC UNIT
(2) CENTRAL PROCESSING UNIT
(3) CONTROL UNIT
(4) INPUT UNIT
(5) MEMORY UNIT
(6) OUTPUT UNIT



II-4-1
Level 3
Sc
P.2 of 2

ANSWER KEY FOR "A COMPUTER MODEL"



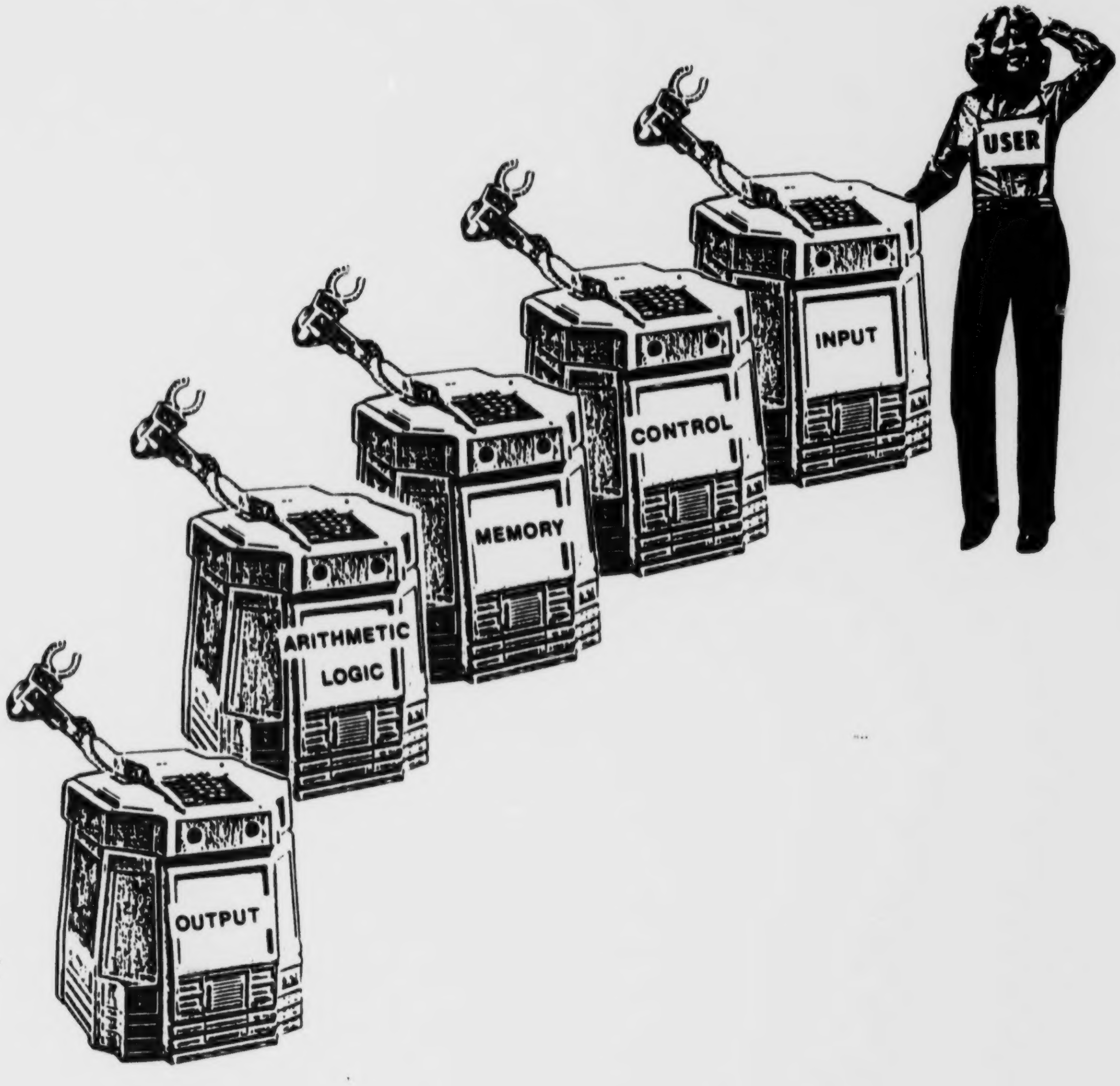

CENTRAL PROCESSING UNIT (CPU)
MEMORY UNIT
INPUT UNIT
CONTROL UNIT
OUTPUT UNIT
ARITHMETIC LOGIC UNIT

THE SIMULATED COMPUTER

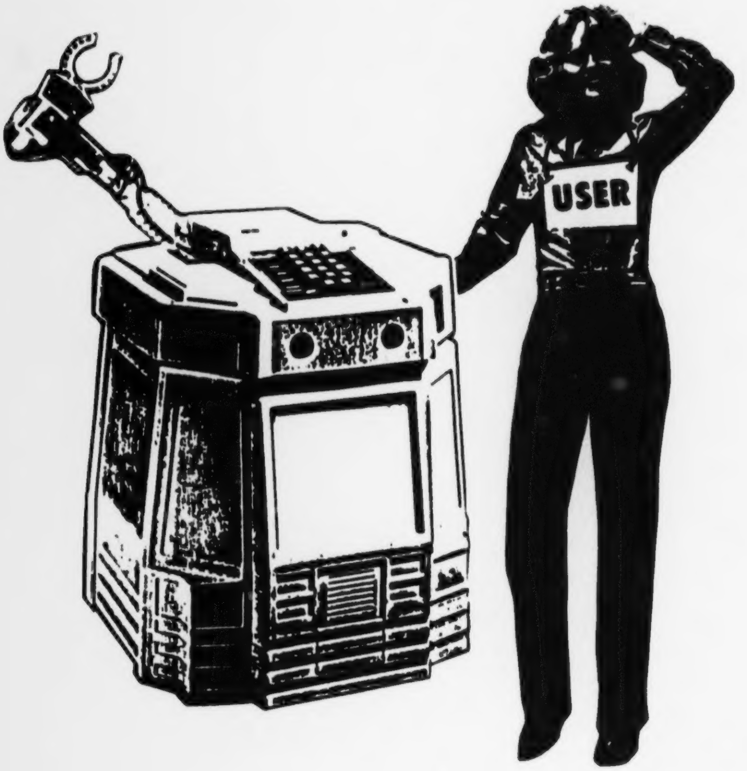
II-4-2
Level 3
LA/Sc
P.1 of 2

DIRECTIONS:

1. Prepare identification cards or badges to be worn by six students. Cards include: USER, INPUT, CONTROL, MEMORY, ARITHMETIC/LOGIC, OUTPUT.
2. Obtain input/output cards and felt pens.
3. Set the stage with the six students wearing the cards and arranged as follows:


USER
INPUT
CONTROL
MEMORY
ARITHMETIC
LOGIC
OUTPUT

172



4. Have the students go through the following steps which a computer would have to perform in order to solve a simple problem.

   1. USER writes an arithmetic problem on a card.
   2. USER gives the problem to INPUT.
   3. INPUT gives the problem to CONTROL.
   4. CONTROL sends the problem to MEMORY.
   5. USER writes the command RUN on a card and gives it to INPUT.
   6. INPUT gives the command RUN to CONTROL.
   7. CONTROL fetches the problem from MEMORY and sends it to ARITHMETIC/LOGIC.
   8. ARITHMETIC/LOGIC solves the problem and gives the answer to CONTROL.
   9. CONTROL sends the answer to OUTPUT.
   10. OUTPUT gives the answer to USER.

5. Discuss the numerous steps that must be carried out by a computer to solve even a very simple problem. However, point out that with its tremendous speed, the computer can go through these many steps so quickly that the solution seems instantaneous.

COMPUTER COMPARISONS

II-5-1
Level 3
Ma/Sc
P.1 of 2

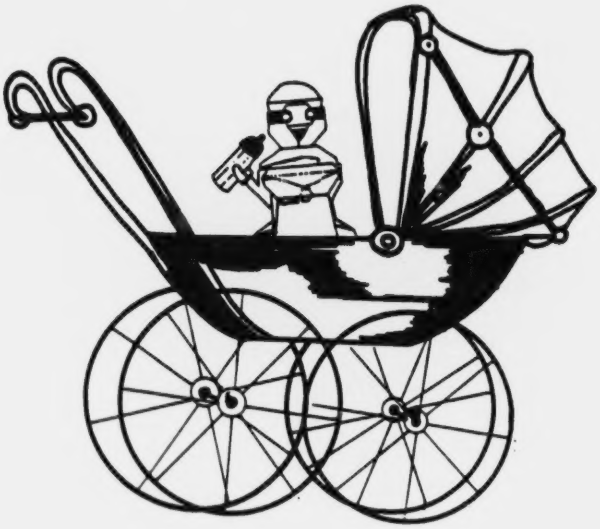
DIRECTIONS:

1. Give each student three sheets of 8½" by 11" graph paper.
2. On the top line of the first page have the student print the heading MICROCOMPUTER, on the second page the heading MINICOMPUTER, and on the third page the heading MAINFRAME.
3. Give the students the following information:

   Average cost of a
   - Microcomputer - $ 1 000
   - Minicomputer - $ 50 000
   - Mainframe - $1 000 000

4. Based on the average cost of the MICROCOMPUTER (let one square on the graph equal $1 000), calculate the number of squares needed on the graph paper to represent the cost of the microcomputer. Colour the appropriate number of squares on the graph paper and label the area "MICROCOMPUTER DOLLAR COST = $1 000".

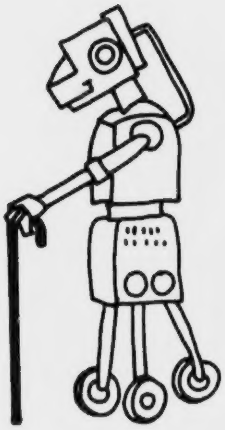
174



5. Using the same scale, repeat the procedure for the MINICOMPUTER and the MAINFRAME.

6. When the graphs are completed, post a sample of each on the classroom bulletin board or make transparencies which can be overlayed to compare the costs.

7. Guide a class discussion on the relative differences of the three types of computers in terms of their physical size, computing power, and cost.



PARLEZ-VOUS COMPUTER?

II-8-1
Level 3
Sc
P.1 of 2

DIRECTIONS:

I. The following programs produce a table of squares from 1 to 10 using four different computer programming languages. Note the similarities and differences.

BASIC

```
10 REM LOOP TO CALCULATE TABLE OF SQUARES
20 FOR T = 1 TO 10
30 LET S = T * T
40 PRINT T, S
50 NEXT T
60 END
```

Pascal

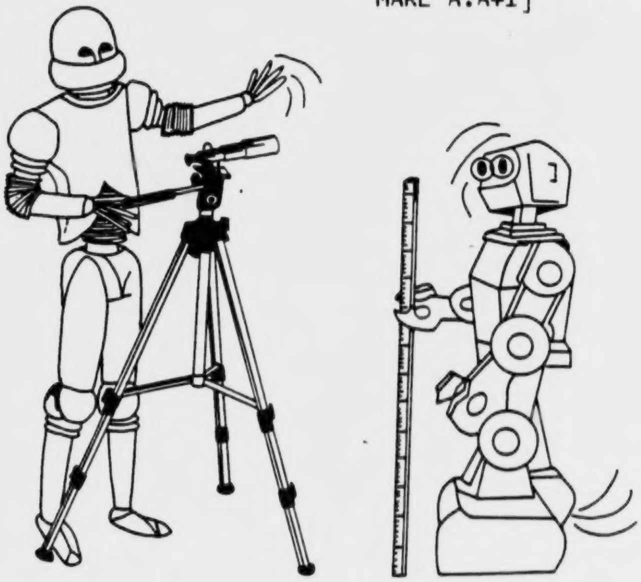
```
PROGRAM SQUARES
(* LOOP TO CALCULATE TABLE OF SQUARES
VAR S: REAL
BEGIN

   FOR T:= 1 TO 10 DO
      BEGIN
         S:= T * T;
         WRITELN(T,S)
      END;
   END.
END.
```

FORTRAN

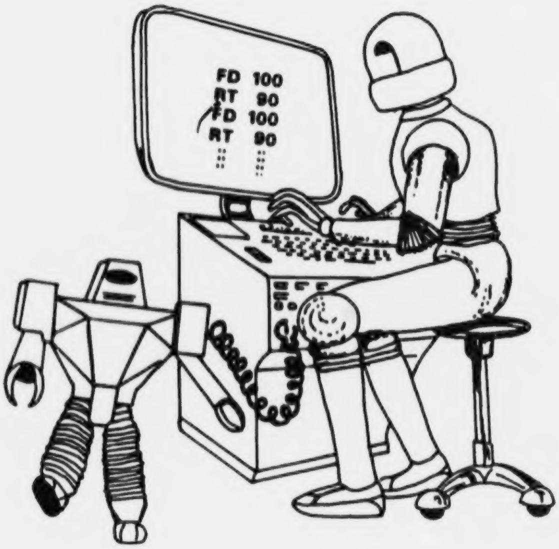
```
C  LOOP TO CALCULATE TABLE
C   OF SQUARES
   REAL S
   INTEGER T

   DO 10 T=1, 10
   S = T * T
10 PRINT, T, S
   STOP
   END
```

Logo

```
MAKE "NUMBER 1
REPEAT 10[PRINT NUMBER
   PRINT NUMBER*NUMBER
   MAKE A:A+1]
```



II-8-1
Level 3
Sc
P.2 of 2



II. The programs below show how the area of a rectangle may be calculated using BASIC, Pascal and FORTRAN.

BASIC

```
10 REM CALCULATE AREA OF A RECTANGLE
20 REM L=LENGTH W=WIDTH A=AREA
30 REM AREA=LENGTH * WIDTH    A=L*W
40 LET L = 10
50 LET W = 5
60 LET A = L * W
70 PRINT A
80 END
```

Pascal

```
PROGRAM AREA
(* CALCULATE AREA OF A RECTANGLE *)
VAR L, W, A: REAL;
BEGIN
   L:=10;
   W:=5;
   A:=L*W;
   WRITELN(A)
END.
```

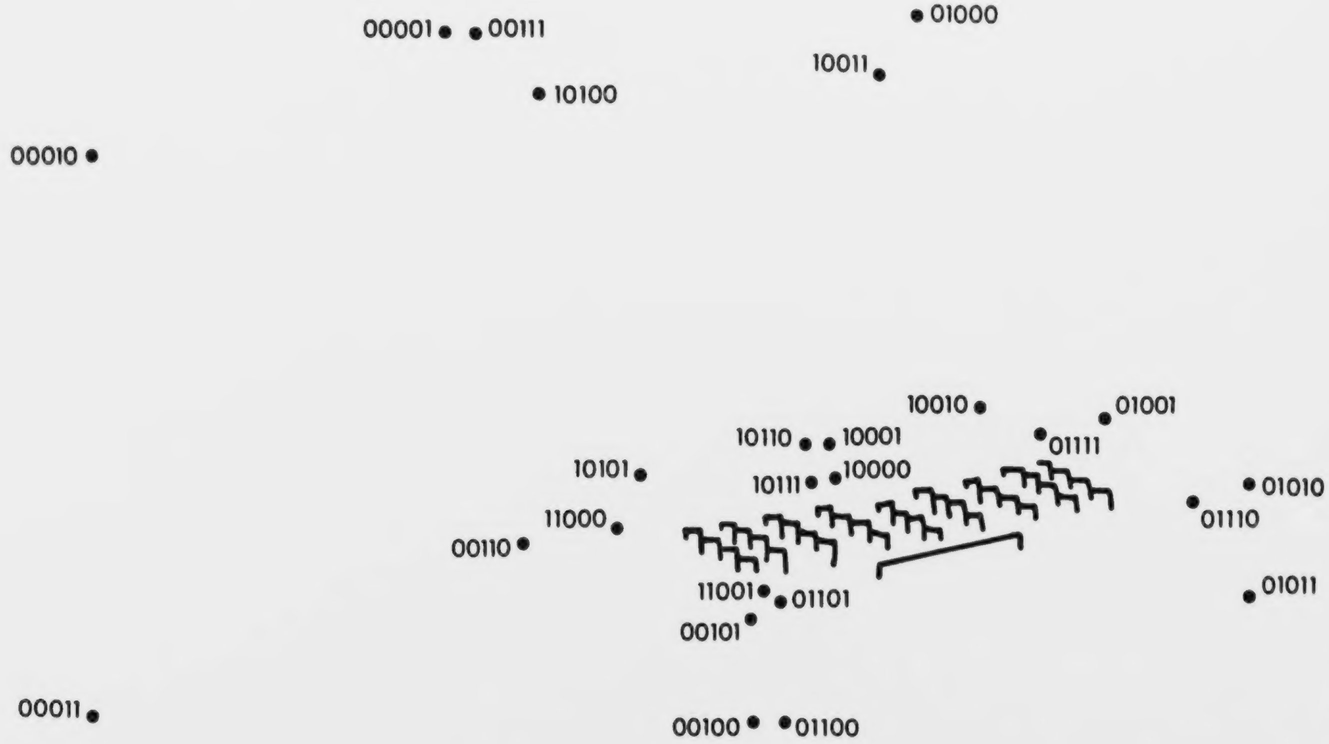
FORTRAN

```
C    CALCULATE AREA OF A
C       RECTANGLE
     REAL L, W, A
     L=10.
     W=5.
     A=L*W
     PRINT, A
     STOP
     END
```

CONNECT THE BINARY DOTS

DIRECTIONS:

Connect the binary dots in sequence using a straight edge. To complete the picture begin at 00001 and end at 11001.



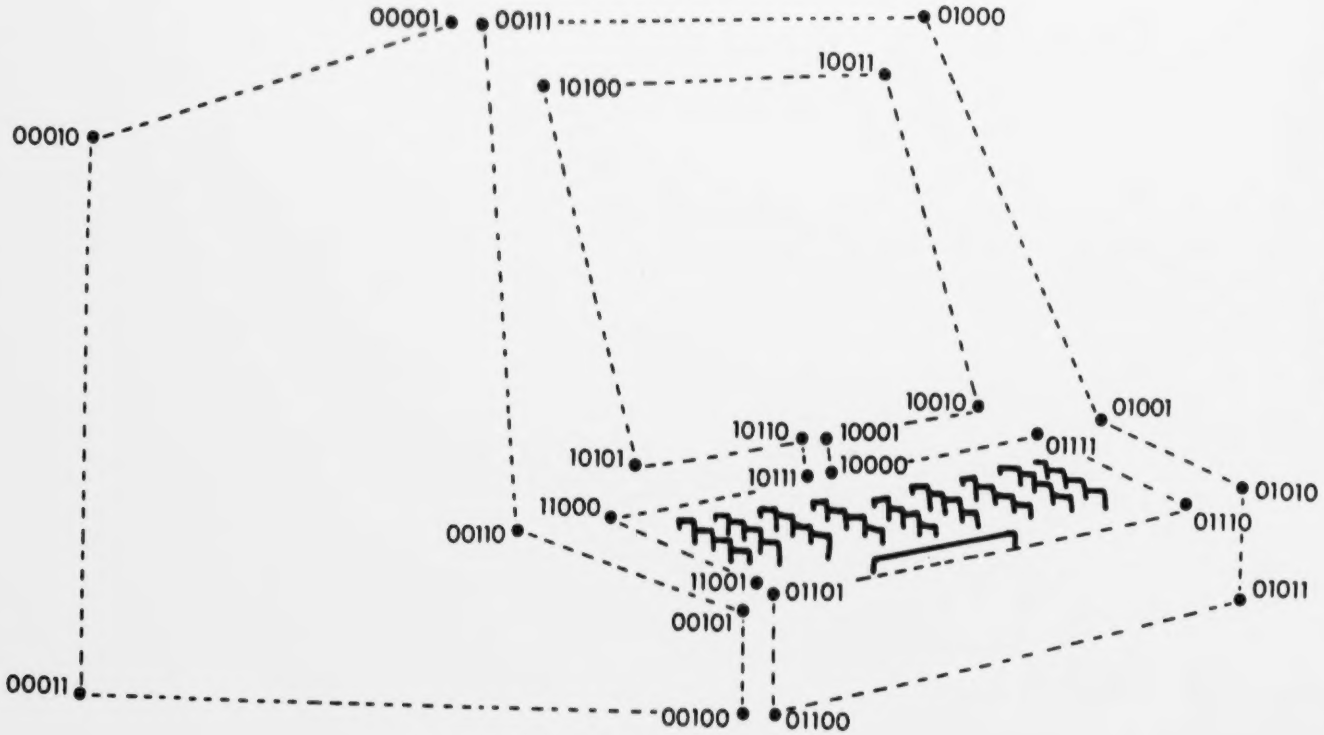
00001
00111
01000
10011
10100
00010
10010
01001
10110
10001
01111
10101
10111
10000
01010
11000
01110
00110
11001
01101
01011
00101
00011
00100
01100

II-9-1
Level 2
Ma
P.1 of 2

322

00 323

ANSWER KEY FOR "CONNECT THE BINARY DOTS"


00001
00111
01000
10011
10100
00010
10010
01001
10110
10001
10101
01111
10111
10000
01010
11000
01110
00110
11001
01101
01011
00101
00011
00100
01100

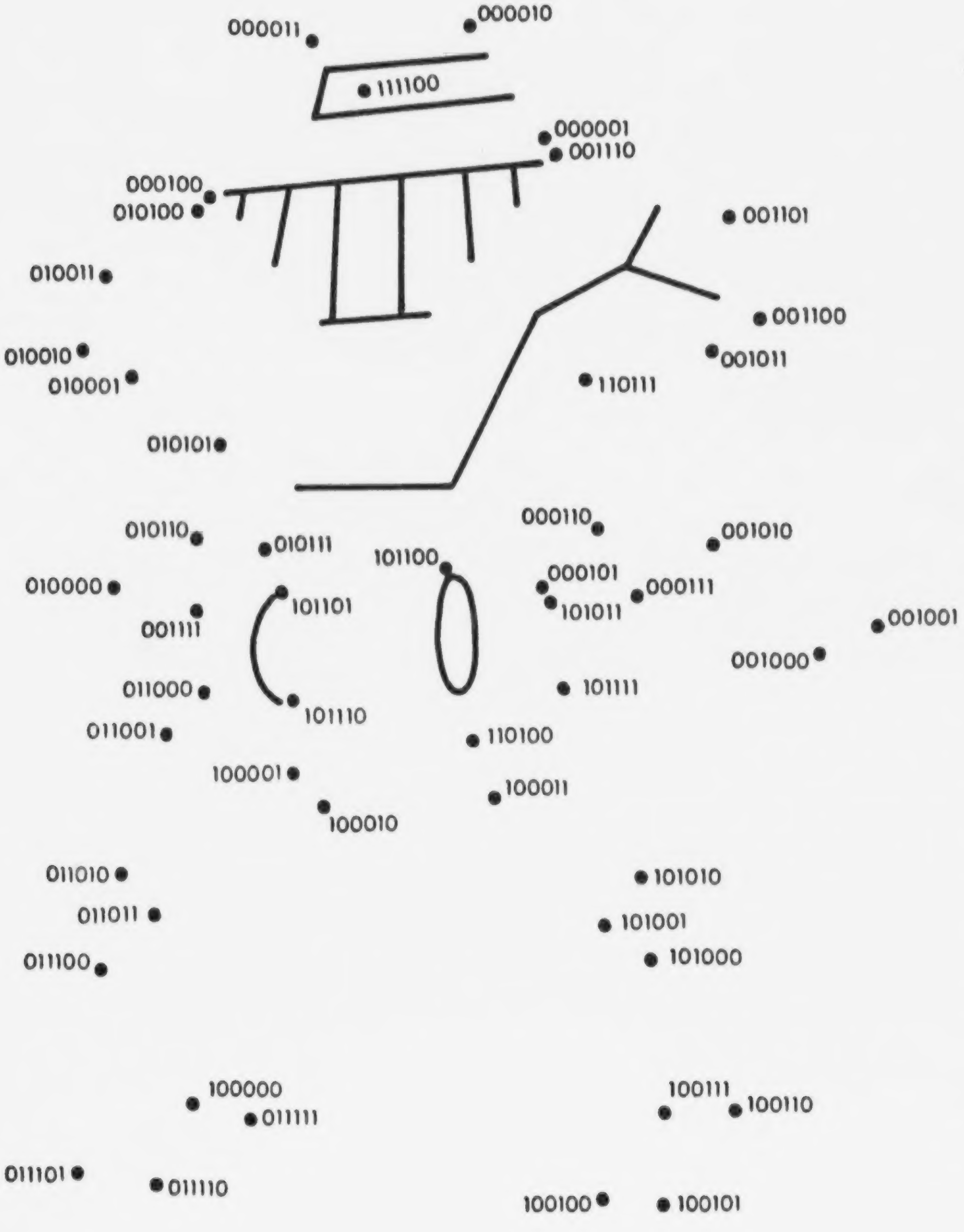
II-9-1
Level 2
Ma
P.2 of 2

II-9-2
Level 2
Ma
P.1 of 2

DOT-TO-DOT – BASE 2

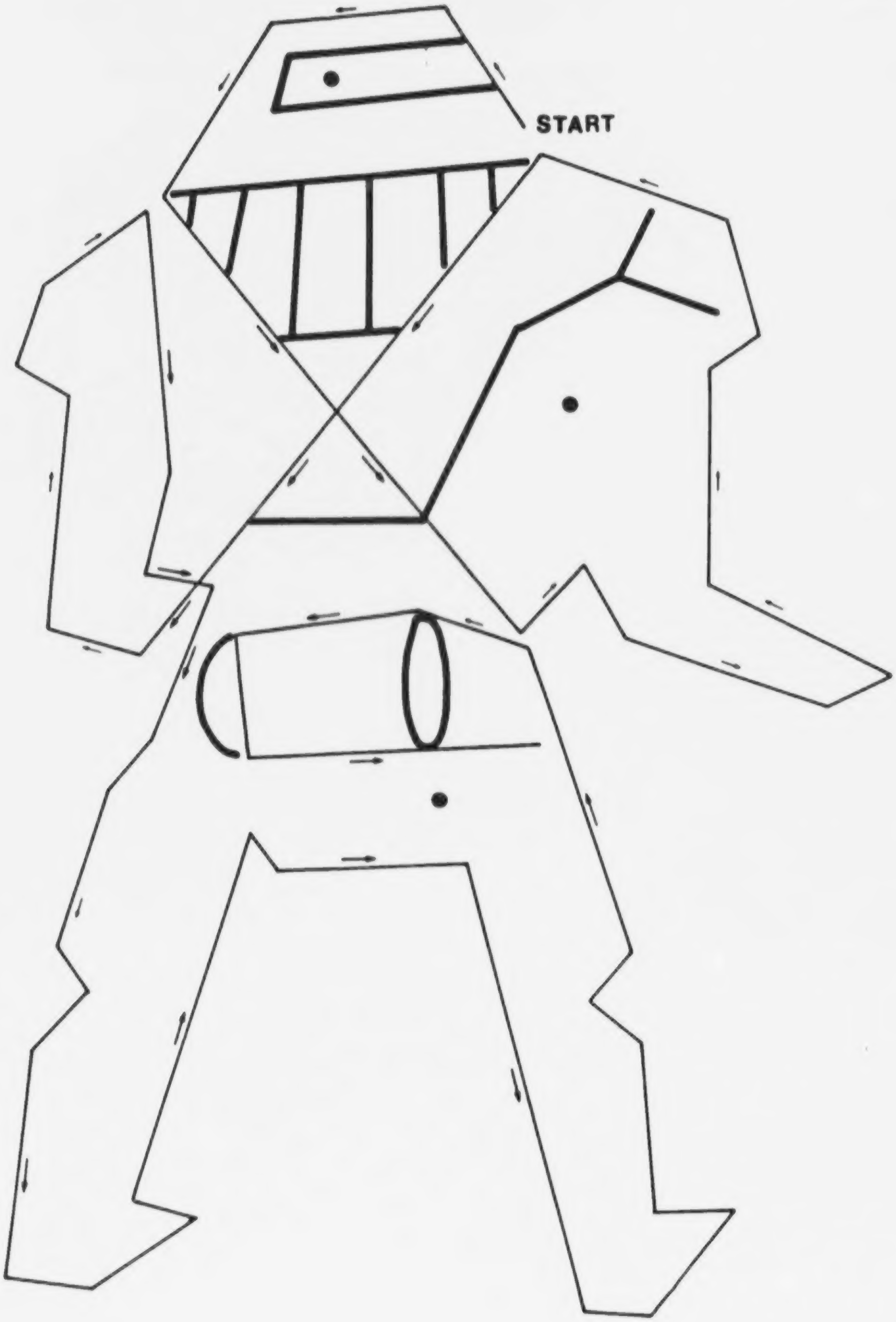
DIRECTIONS:

Connect the binary dots in sequence using a straight edge.


000011
000010
111100
000001
001110
000100
010100
001101
010011
001100
010010
001011
010001
110111
010101
000110
010110
001010
010111
101100
010000
000101
000111
001111
101101
101011
001001
001000
011000
101110
101111
011001
110100
100001
100011
100010
011010
101010
011011
101001
011100
101000
100000
100111
100110
011111
011101
011110
100100
100101

ANSWER KEY FOR "DOT-TO-DOT – BASE 2"

II-9-2
Level 2
Ma
P.2 of 2



II-9-3
Level 3
Ma
P.1 of 3

CODED CARTOON CAPTIONS

DIRECTIONS:

Using the six bit binary coded decimal (BCD) code permits a maximum of sixty-four different six bit strings. Each of these unique strings is used to represent one of the sixty-four alphanumeric characters below:

Alphanumeric Character	Computer Code	Alphanumeric Character	Computer Code
0	000000	↑	100000
1	000001	J	100001
2	000010	K	100010
3	000011	L	100011
4	000100	M	100100
5	000101	N	100101
6	000110	O	100110
7	000111	P	100111
8	001000	Q	101000
9	001001	R	101001
[	001010	-	101010
#	001011	$	101011
@	001100	*	101100
:	001101	)	101101
>	001110	;	101110
?	001111	'	101111
(space)	010000	+	110000
A	010001	/	110001
B	010010	S	110010
C	010011	T	110011
D	010100	U	110100
E	010101	V	110101
F	010110	W	110110
G	010111	X	110111
H	011000	Y	111000
I	011001	Z	111001
&	011010	←	111010
.	011011	,	111011
]	011100	%	111100
(	011101	=	111101
<	011110	"	111110
↓	011111	!	111111

Assignment

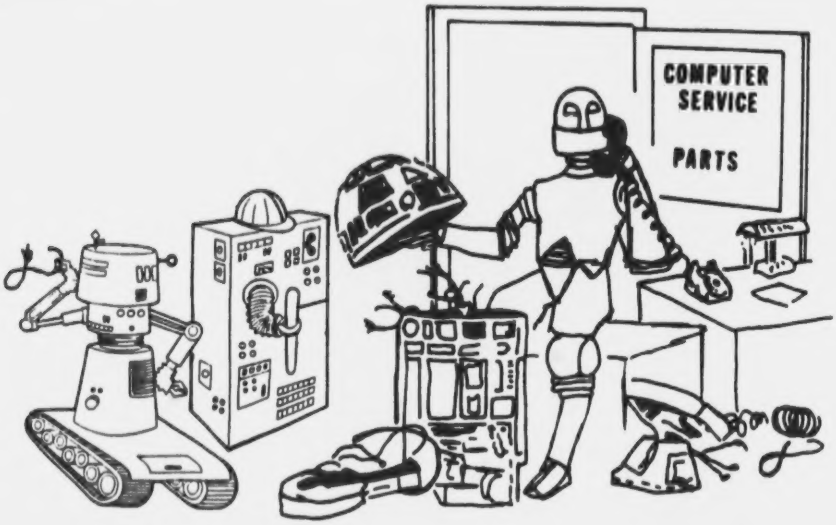
1. Represent your first and last name using the six bit BCD code chart shown above. Print the corresponding character above each six bit BCD code. When you have finished this task, exchange your coding with someone else in class and check each other's conversion for accuracy.

II-9-3
Level 3
Ma
P.2 of 3

2. Interpret the captions for Cartoon 1 and Cartoon 2, using the BCD code given on page 1. Write the decoded caption in the space provided at the bottom of each page.

3. Draw your own computer cartoon and write your caption using binary notation.

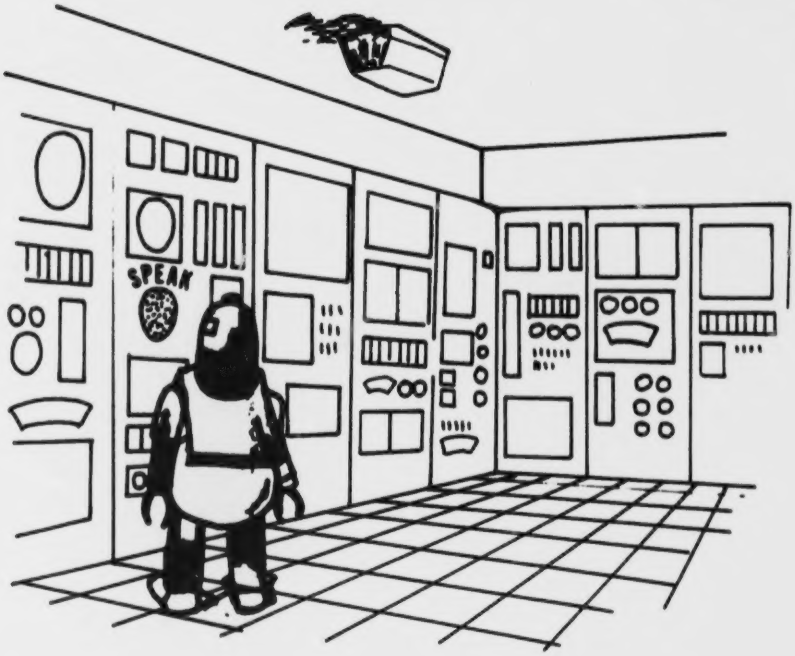
Cartoon #1



010111	011001	110101	010101	010000
011001	110011	010000	010001	010000
010111	100110	100110	010100	111011
110010	110110	011001	010110	110011
010000	100010	011001	010011	100010

II-9-3
Level 3
Ma
P.3 of 3

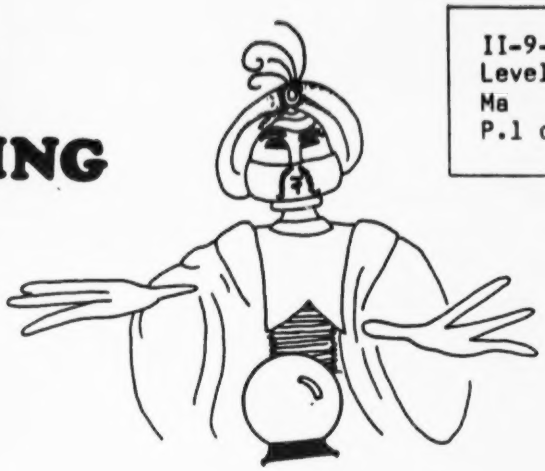
Cartoon #2



111110	010001	100101	010100	010000
011001	010110	010000	111000	100110
110100	010000	010111	010101	110011
010000	110010	110011	110100	010011
100010	111011	010000	010111	011001
110101	010101	010000	100100	010101
010000	010001	010000	110010	011000
100110	110100	110011	011011	111110

BINARY MIND READING

II-9-4
Level 3
Ma
P.1 of 1



DIRECTIONS:

1. Make up four cards like the following:

C	O	D	E
8 9 10	4 5 6	2 3 6	1 3 5
11 12 13	7 12 13	7 10 11	7 9 11
14 15	14 15	14 15	13 15

On the back of the C card write the number 8, on the back of the O card write the number 4, on the back of the D card write the number 2, and on the back of the E card write the number 1.

2. Have your friend think of a number between 1 and 15. You then hold up each card and have your friend tell you which of the four cards the number is on. Try to figure out the code to determine their number. (HINT: Try the same procedure with several more numbers and write the results down.)

EXTENSION:

a) Make up cards to extend the game to numbers between 0 and 50.

b) Go to the library and find information on the mathematical game of NIM.

HISTORY HUNT

III-1-1
Level 1
LA/SS
P.1 of 2

DIRECTIONS:

Words which are associated with computer history are hidden in the puzzle below. The words are printed horizontally, vertically, diagonally and even backwards in the puzzle. Find the following 24 words.

ABACUS
ADDINGMACHINE
AIKEN
ANALYTICALENGINE
BABBAGE
BOOLE
DIFFERENCEENGINE
ECKERT
EDSAC
ENIAC
HOLLERITH
JACQUARD
LEIBNIZ
LOGARITHM
LOVELACE
MAUCHLY
NAPIER
PASCAL
STONEHENGE
SLIDERULE
TUBE
TRANSISTOR
UNIVAC
WATSON

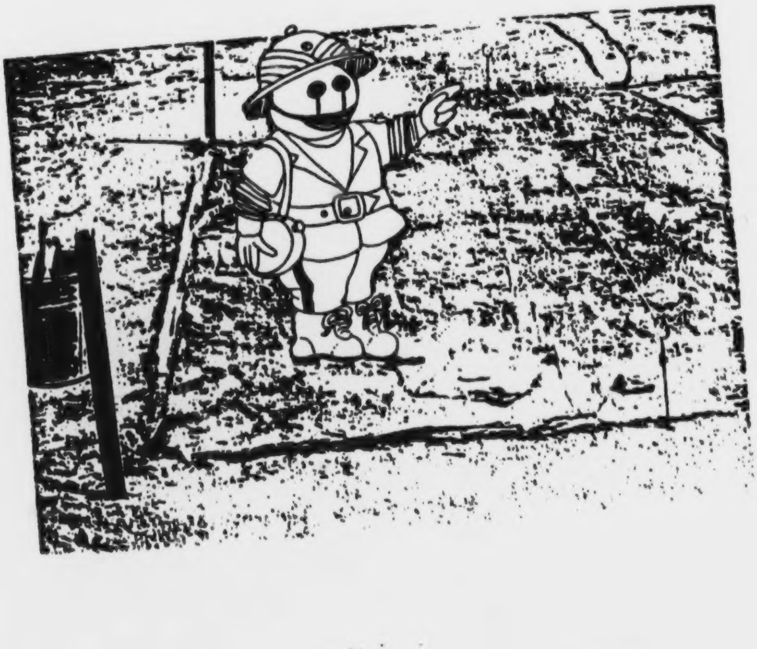
```
M N W A H F N Y A N A L Y T I C A L E N G I N E
P R E Q L O M T O V G Y E F K I P P C R L N M L
S J I K E G X S I T K L Y X J M J Y Q N S R K R
C C R R I M T Y R F U K O S B Q E Q V P L A X D
I L A C S A P E R R E C O S D N E L Y T J X N I
X I E G W U K H E N B J N V I G V H H Q Z J U F
U N I V A C D D R A U Q C A J G V F E V L A N F
N T U B E H I C C O I D C N P Z B G T J C S S E
S X C W Q L O G A R I T H M I I N Z R B U D R R
N M L R S Y I M S D K Y D N L E E N T P K O F E
C C F K I I P X D S D O B H H F F R L Q I M Z N
V Z M X T T T E E H T I R E L L O H S T A D O C
B U R G S D R C R I E N N X G E P U Z K U P K E
P K S U C A B A S L D O J G I A R K M M W T T E
T Y C F L Y E L N X T P U C M I B J D Q M O L N
D C S J K E B E I S D I V H G A H B J V T O O G
N T J N M T W V R F I D P O Q T C D A Q O M J I
F V L R V Z A O E C M S G Q F L O H N B N E V N
N Y X Z W G N L E X U Z T L C L V Z I G R D I E
C D X V I O H W X S C S A O C Q S K W N N I Y J
S A F X Q W A O Q D V W T Y R X U P X A E B O Y
```

Solution to "HISTORY HUNT"

III-1-1
Level 1
LA/SS
P.2 of 2

```
. N . . . . . . A N A L Y T I C A L E N G I N E
. . E . . . . . O . . . E . . . . . . . . . . .
. . . K . . . S . T . L . . . . . . . . . . . .
. . . . I M T . R . U . . . . . E . . . . . . D
. L A C S A P E . R . . . . . N . . . . . . . I
. . . . W U K . E . . . N . I . . . . . . . . F
U N I V A C . D R A U Q C A J . . . E . . . . F
. T U B E H I . C . . . C . P Z . G . . . . . E
. . . . . L O G A R I T H M I I N . . . . . . R
. . . . S Y . . S D . . . N . E E . . . . . . E
. . . . . . . . D . D . B . H . . R . . . . . N
. . . . . T . E E H T I R E L L O H . . . . . C
. . . . . . R C . . E . N . G . . . . . . . . E
. . S U C A B A . L . O . G . A . . . . . . . E
. . . . . . . L N . T . . . M . B . . . . . L N
. . . . . . . E . S . . . . . A . B . . . O . G
. . . . . . . V . . I . . . . . C . A . O . . I
. . . . . . . O . . . S . . . . . H . B . . . N
. . . . . . . L . . . . T . . . . . I . . . . E
. . . . . . . . . . . . . O . . . . . N . . . .
. . . . . . . . . . . . . . R . . . . . . E . . .
. . . . . . . . . . . . . .
```

187



GENERATION GAPS

III-2-1
Level 2
LA/SS
P.1 of 2

188

DIRECTIONS:

Words which are associated with computer history are hidden in the puzzle below. The words are printed horizontally, vertically, diagonally and even backwards in the puzzle. Find the following 23 words.

BASIC
BATCHPROCESSING
BUBBLEMEMORY
CHIP
COBOL
CORE
ENIAC
FORTRAN
GENERATION
INTEGRATEDCIRCUIT
INTEL
LOGO
MAINFRAME
MICROCOMPUTER
MICROSECOND
MINICOMPUTER
MICROPROCESSING
NANOSECOND
ONLINE
PROGRAM
TERMINAL
TRANSISTOR
VACUUMTUBE

```
G E R J E T U I K U U I U U J H G T S M R K E J S O L
I N T E G R A T E D C I R C U I T C L A K C T H F G X
E Q I U B X J T S F S K D D Q R G K K C H T Y T Q U W
W R U S S C F Z D L W Y O L Z J I L M X O Y G R R Y O
F Z M W S Q P H Z J P D C I J Z H O H T Q S O V U E M
O P D Q C E J F S L T W I X O U T B C O B O F C H P U
W E D R E K C C S Q Q V F A N C A U P J T T X T M C X
M N B R C J K O X C L Y B R L S Y R J N I H N H Q Q W
I H P U M G U Q R W U C F M I H Q O F V M D W D R J R
L W S D T T I J P P I S D C N J E F A F H D R B Q V H
E T E N F M K E Y R O M E M E L B B U B C C K N C F C
T X B L Z M U Z D R E R H E G F X F U M T E V U T J N
X D O O I O N U H B A T C H P R O C E S S I N G P U A
G Q I V W O C D C R R O U I P T E R A V J H D W G W Q
U K C K K E D G F A B X S P M F H T T I E T A J O V L
E D W H X U F K N O V S C P M M V Z U R N X H I S A G
Y R X G Q X S S L E T N I I N O W U J P A E E P N J R
Z T F Q H W I G K K M H E P A D C Y U B M N X I U X X
U W X O F S W E R O C L M M N O L O G O Q O M L M P M
K J F G T I Y G W O I D A A O J A L R P T R C R D S F
F J B O J O W B D I T W R R S I X R H C E B F I W U X
E C R H X H T L Z P O A F G E N E R A T I O N K N J M
T B A E C C A Y Q X I D N O C E S O R C I M T H G I Z
H I K W R Y D W G Y L D I R O I R R O T E Y X K Q V M
P P H D F Q D E W Q F Z A P N K G C G B L P W Y J R I
Y U P X X O O Q H G G S M F D J S C B M V N I U O O U
```

III-2-1
Level 2
LA/SS
P.2 of 2

Solution to

"GENERATION GAPS"

```
G . . . . . . . . . . . . . . . . . . . . . . . . . .
I N T E G R A T E D C I R C U I T . . . . . . . . . .
. . I . . . . . . . . . . . . . . . . . . . . . . . .
. . . S . . . . . . . . . . . . . . . . . . . . . . .
. . . . S . . . . . . . . . . . . . . . . . . . . . .
. . . . . E . . . . . . . . O . . B . . . . . . . . .
. E . . . . C . . . . . . . N . A . . . . . . . . . .
. . B . . . . O . . . . . . L S . . . . . . . . . . .
. . . U . . . . R . . . . . I . . . . . . . . . . . .
. . . . T . . . . P . . . C N . . . . . . . . . . . .
. . . . . M . . Y R O M E M E L B B U B . . . . . . .
. . . . . . U . . . E R . . . F . . . . . . . . . . .
. . . . . . . U . B A T C H P R O C E S S I N G . . .
. . . . . . . . C . R O U I . . E R A . . . . . . . .
. . . . . . . . . A B . . P M . . T T I . . . . . . L
. . . . . . . . N O V . . P M . . . U R N . . . . A .
. . . . . . . S L E T N I . N O . . . P A E . . N . .
. . . . . . I . . . . H E . A . C . . . M N . I . . .
. . . . . S . E R O C . M M N . L O G O . O M . . . .
. . . . T . . . . . . . A A O . . . R . . R C . . . .
. . . O . . . . . . . . R R S . . . . C E . . I . . .
. . R . . . . . . . . . F G E N E R A T I O N . N . .
. . . . . . . . . . . D N O C E S O R C I M . . . I .
. . . . . . . . . . . . I R O . . . . . . . . . . . M
. . . . . . . . . . . . A P N . . . . . . . . . . . .
. . . . . . . . . . . . M . D . . . . . . . . . . . .
```

SPEEDY COMPUTER

DIRECTIONS:

1. Ask the class to write down on scrap paper the numbers 1, 2, 3, 4, ... as fast as they can during a 15 second time interval. After this exercise, record the highest number written by members of the class. The following BASIC program will cause a microcomputer to print the numbers 1,2,3,4, ... on the screen:

   ```
   10 FOR I=1 TO 10000
   20 PRINT I
   30 NEXT I
   ```

   NOTE: O is the letter "oh"
   where as 0 is the numeral zero

   After this program is entered, type RUN and begin the 15 second time interval just as you press the <ENTER/RETURN>. When the time is up, press <BREAK/STOP> to halt the printing on the screen.

   - What was the last value printed? Record this number and compare it with the students' results.
   - How many times faster is the computer than a human?

2. The next step is to suggest to the class that they could probably count faster and higher if they did not have to write down the individual numbers. This time ask the class to count 1, 2, 3, 4, ... silently as fast as they can during a 15 second interval. Again record the highest value reached after 15 seconds. Modify the previous microcomputer program by deleting line 20. This can be accomplished quickly by typing 20 and then pressing <ENTER/RETURN>. If LIST is typed in, the program should appear as follows:

   ```
   10 FOR I = 1 TO 10000
   30 NEXT I
   ```

Explain to the class that since the computer has not been told to PRINT the numbers on the screen, it will simply count and the screen will remain unchanged. Type RUN and press <ENTER/RETURN>. After 15 seconds press <BREAK/STOP>. To determine what value the computer counted to before it was interrupted, type PRINT I (with no line number preceding the command) and then the computer will display the value. Record the result.

- How much faster is the computer compared with the class?
- How much faster is the computer at counting compared to printing out the values?

SORTING THINGS OUT

III-3-2
Level 3
TU
P.1 of 4

DIRECTIONS:

An interesting comparison can be made between the time it takes a person and a computer to arrange thirty names in alphabetical order. Enter the following program into the microcomputer.

Programming Notes:

- This program is written for a Commodore micro. Lines 50 and 170 clear the screen. Modify them if you are not using a PET. For example: 50 HOME (for APPLE), 50 CLS (for TRS-80).
- TRS-80 users must modify line 160 to: 160 R$=INKEY$:IF R$<>"C" THEN 160

```
5 REM * COMPUTER AWARENESS DEMO
6 REM * TO ILLUSTRATE COMPUTER SORTING SPEED
10 DIM A$(30),A(30)
20 FOR K=1 TO 30
30 READ A$(K)
35 A(K)=K
40 NEXT K
50 PRINT "♥"
60 PRINT"   HOW LONG WILL IT TAKE YOU TO LIST"
70 PRINT"THE FOLLOWING THIRTY NAMES IN"
80 PRINT"ALPHABETICAL ORDER?"
85 PRINT
90 FOR K=1 TO 28 STEP 3
100 PRINTTAB(1);A$(K)TAB(15);A$(K+1)TAB(27);A$(K+2)
110 NEXT K
130 PRINT
132 PRINT"   ONCE YOU HAVE COMPLETED THIS SORTING"
134 PRINT"TASK AND HAVE RECORDED YOUR TIME IN"
136 PRINT"SECONDS,GET READY TO CHECK THE"
138 PRINT"COMPUTER'S SPEED AND ACCURACY.
140 PRINT
142 PRINT"   WHEN YOU ARE READY TO BEGIN TIMING"
144 PRINT"THE COMPUTER, PRESS 'C' TO CONTINUE AS"
146 PRINT"YOU BEGIN COUNTING THE SECONDS."
160 GET R$:IF R$ <> "C" THEN 160
170 PRINT"♥"
190 PRINT"   ONE MOMENT PLEASE ..."
195 PRINT
200 PRINT"   I'M BUSY ALPHABETIZING."
```

```
210 FOR J=2 TO 30
220 T=A(J)
230 I=J-1
240 IF A$(T)>=A$(A(I)) THEN 280
250 A (I+1)=A(I)
260 I=I-1
270 GOTO 240
280 A(I+1)=T
290 NEXT J
320 PRINT
340 FOR K=1 TO 10
350 PRINTTAB(1);A$(A(K));TAB(15);A$(A(K+10));TAB(27);A$(A(K+20))
360 NEXT K
370 PRINT:PRINT
380 PRINT"   YOU SHOULD NOW COMPARE YOUR SORTED"
390 PRINT"LIST OF NAMES WITH THIS COMPUTER"
400 PRINT"DISPLAY TO SEE IF THERE ARE ANY NAMES"
410 PRINT"WHICH ARE IN THE WRONG ORDER."
420 PRINT
430 PRINT"                        THANK YOU"
500 DATA ISAAK,SCHREYER,JONASSON
510 DATA NIELSON,FITKOWSKY,AIKENHEAD
520 DATA HENDERSON,RICHARDS,FEATHERSTONE
530 DATA ISAACS,BANNATYNE,RICHARDSON
540 DATA SCHROEDER,NELSON,MCCULLOCH
550 DATA COLLENS,SAMBORSKI,ACKLAND
560 DATA ORETZKI,SAWCHUK,COLLINS
570 DATA RICHARD,JONES,POIRIER
580 DATA O'GRADY,JONASSEN,NIELSEN
590 DATA REIMER, ISAAC,LAMOUREUX
700 END
```

Student Directions:

In this activity compare the time that it takes both you and a computer to arrange the following names in alphabetical order. Enter the exact starting time (hours, minutes, and seconds) in the space provided. Once you have completed the alphabetical sorting task, place the exact time that you finish in the corresponding space.

Start Time: (H:M:S) = ___:___:___ Finish Time: (H:M:S) = ___:___:___

Once the start time has been entered, look over the list of the names which appear below. Begin arranging the names in alphabetical order from A to Z. Enter the names in the correct order in the space provided.

UNSORTED LIST

ISAAK
NIELSON
HENDERSON
ISAACS
SCHROEDER
COLLENS
ORETZKI
RICHARD
O'GRADY
REIMER
SCHREYER
FITKOWSKY
RICHARDS
BANNATYNE
NELSON
SAMBORSKI
SAWCHUK
JONES
JONASSEN
ISAAC
JONASSON
AIKENHEAD
FEATHERSTONE
RICHARDSON
MCCULLOCH
ACKLAND
COLLINS
POIRIER
NIELSEN
LAMOUREUX

SORTED LIST

1. ____________
2. ____________
3. ____________
4. ____________
5. ____________
6. ____________
7. ____________
8. ____________
9. ____________
10. ____________
11. ____________
12. ____________
13. ____________
14. ____________
15. ____________
16. ____________
17. ____________
18. ____________
19. ____________
20. ____________
21. ____________
22. ____________
23. ____________
24. ____________
25. ____________
26. ____________
27. ____________
28. ____________
29. ____________
30. ____________

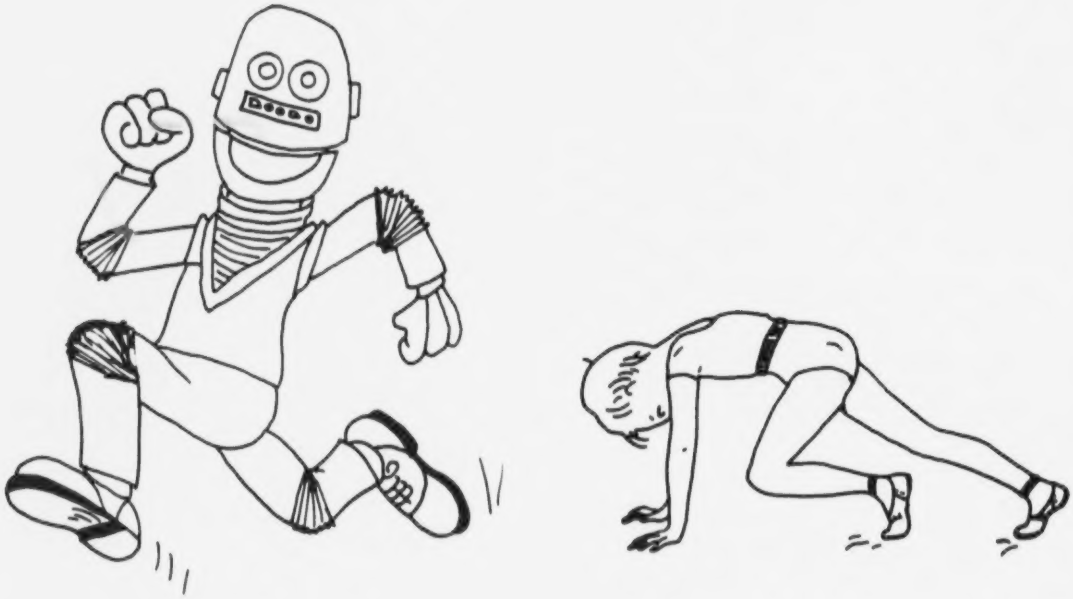
Now, run the sorting program on the computer and determine how many seconds it takes the computer to sort the list of names. Record below both your time and the computer's time (in seconds) to complete the identical job.

My time (in seconds) = ______ Computer time (in seconds) ______

Check your sorted list against the computer list to see if any errors were made in the sorting process. Did you make any errors? ________

Now divide your time in seconds by the computer's time and place the answer below. This value roughly indicates how many times faster the computer is at sorting these names than you were. It may be somewhat more accurate too! Compare your results with other students.

(My time)/(Computer time) = ______



10100
QUESTIONS

III-3-3
Level 3
LA/SS
P.1 of 2

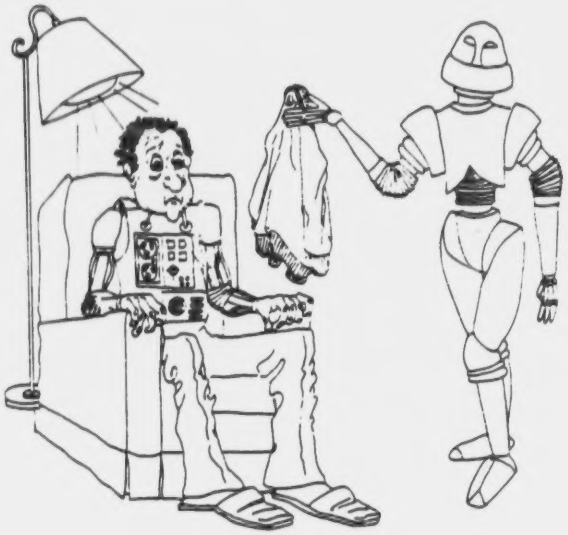
DIRECTIONS:

1. Print your name at the top of your Record Sheet.

2. In order to determine the name of the person/device written on the card attached to your back:

   - ask one question which can be answered by "Yes" or "No" of each student in the class.
   - record each question, the reply and the initials of the classmate who replied.
   - continue asking one question of each student in the class until you discover the "secret identity" of the person/device identified on your back.

3. Record the "secret identity" in the space provided at the bottom of the Record Sheet.



*10100 in binary code is equivalent to 20 in decimal notation.

III-3-3
Level 3
LA/SS
P.2 of 2

10100 QUESTIONS

RECORD SHEET

STUDENT NAME: ....

	QUESTIONS	REPLY Y/N	INITIALS
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
	PERSON/DEVICE:		

PERPLEXING PARENTHESES

IV-B1-1
Level 2
Ma
P.1 of 2

DIRECTIONS:

Modify the following numerical phrases by inserting brackets so that the resulting phrase agrees with the answer shown.

		Answer
1)	5*3+7	50
2)	20/2+2	5
3)	7-4↑2	9
4)	17-5+3/2	13
5)	30/16-6+2	5
6)	4+8/2	6
7)	15/3+2	3
8)	40-30↑5+3	10 003
9)	60+20/5+3+2	12
10)	12+3-2↑2-5+3	5

Solution to “PERPLEXING PARENTHESES”

IV-B1-1
Level 2
Ma
P.2 of 2

1) 5*(3+7)=50

2) 20/(2+2)=5

3) (7-4)↑2=9

4) 17-(5+3)/2=13

5) 30/(16-6)+2=5

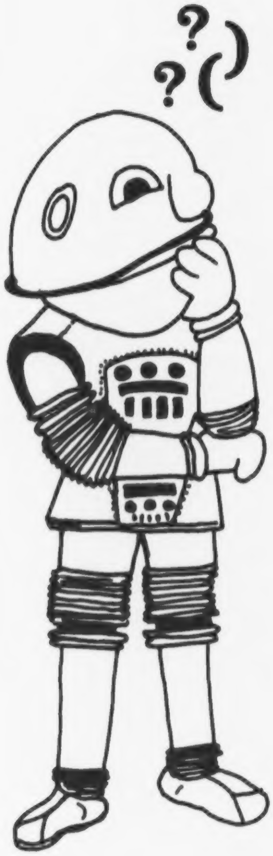
6) (4+8)/2=6

7) 15/(3+2)=3

8) (40-30)↑5+3=10 003

9) (60+20)/(5+3)+2=12

10) 12+(3-2)↑2-(5+3)=5



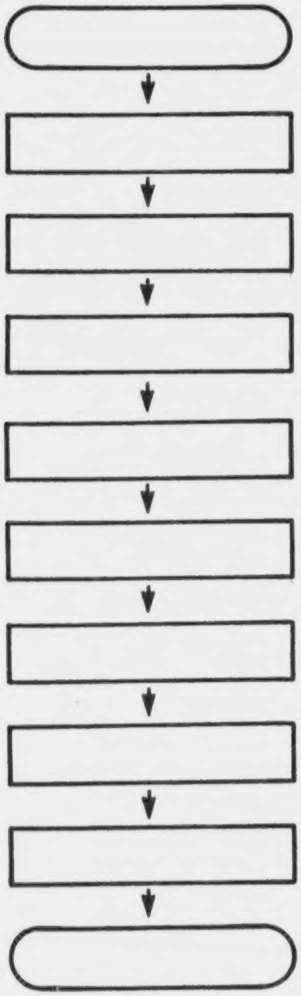
FASCINATING FLOWCHARTING

IV-B4-1
Level 1
LA
P.1 of 2

DIRECTIONS:

1. Complete the following flowchart by printing the appropriate step number in the blank shapes.

FLOWCHART



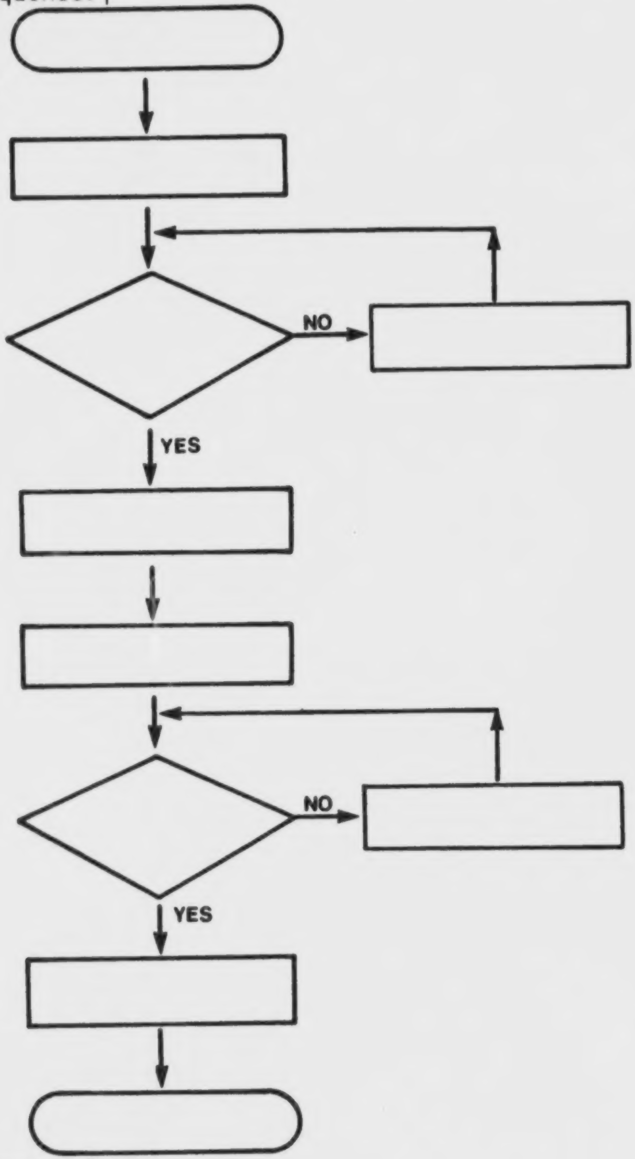
MISSING STEPS

1. put scoop of ice cream in dish
2. get out ingredients
3. spray whip cream on sauce
4. put a cherry on top
5. stop
6. get out a dish and a spoon
7. start
8. pour chocolate sauce on ice-cream
9. enjoy sundae
10. scoop out ice cream

IV-B4-1
Level 1
LA
P.2 of 2

2. The flowchart below represents the steps which are involved in watching television. Put the steps in the proper sequence on the flowchart by placing the step number in the proper symbol. [Note that the steps are not listed in the proper sequence.]

1. Select the T.V. channe
2. Is the "pop" cold?
3. Adjust T.V.
4. Return "pop" to refrigerator
5. Turn on T.V.
6. Is T.V. working properly?
7. Start
8. Enjoy T.V. program
9. Halt or Stop
10. Get "pop" during T.V. commercial



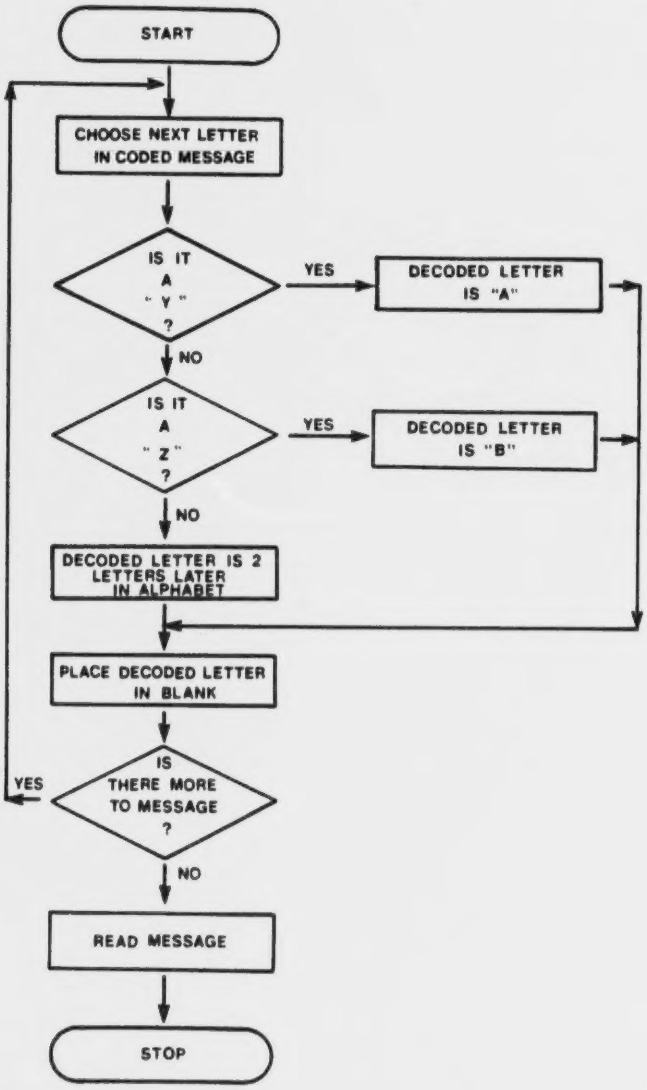
3. Design a flowchart for making a pizza.

SHERLOCK ROBOT

IV-B4-2
Level 2
LA
P.1 of 1

DIRECTIONS:

Use the flowchart below to decode the secret message.


START
CHOOSE NEXT LETTER IN CODED MESSAGE
IS IT A " Y " ?
YES
DECODED LETTER IS "A"
NO
IS IT A " Z " ?
YES
DECODED LETTER IS "B"
NO
DECODED LETTER IS 2 LETTERS LATER IN ALPHABET
PLACE DECODED LETTER IN BLANK
IS THERE MORE TO MESSAGE ?
YES
NO
READ MESSAGE
STOP

Coded: AMKNSRCPQ LCTCP KYIC KGQRCYIQ

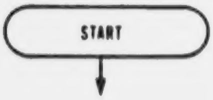
Decoded: _________ _____ ____ ________

MISSION IMPOSSIBLE

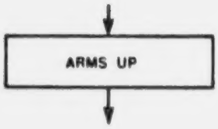
IV-B4-3
Level 3
LA
P.1 of 1

DIRECTIONS:

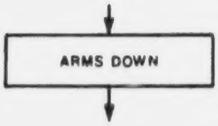
Draw a flowchart of the procedure necessary to command a robot, who is sitting in a chair facing a wall a short distance away, to walk to the wall and return to its original position. If necessary, act out the procedure prior to arranging the flowchart. The following flowchart symbols may be used:



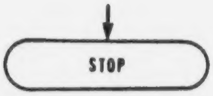
Begin the procedure.



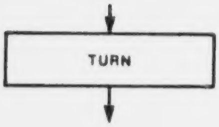
Raise arms straight out.



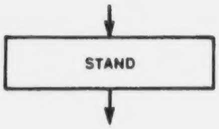
Lower arms.



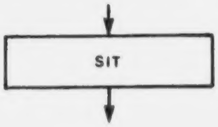
Halt the procedure.



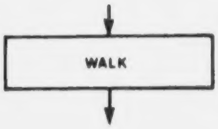
Turn 90°
to the right



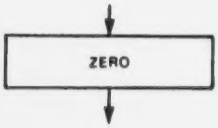
Stand up.



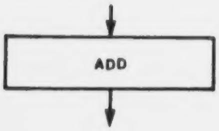
Sit down.



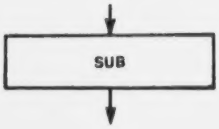
Take one step.



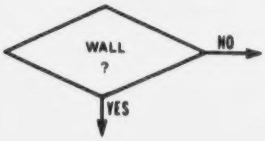
Set the counter to zero.



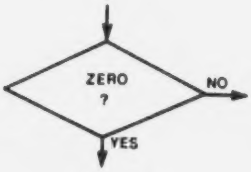
Add 1 to the counter.



Subtract 1 from the counter.



Test for touching wall. Arms must be straight forward to activate the finger-contact units.



Test if counter is zero.

PRINT PREDICTIONS

IV-B5-1
Level 1
H-o
P.1 of 2

DIRECTIONS:

For each of the following programs, indicate the output which will occur when the program is RUN. Show the position of the output. Check by running each program. Assume that the screen is cleared at the start of the execution of each new program.

PROGRAM | OUTPUT

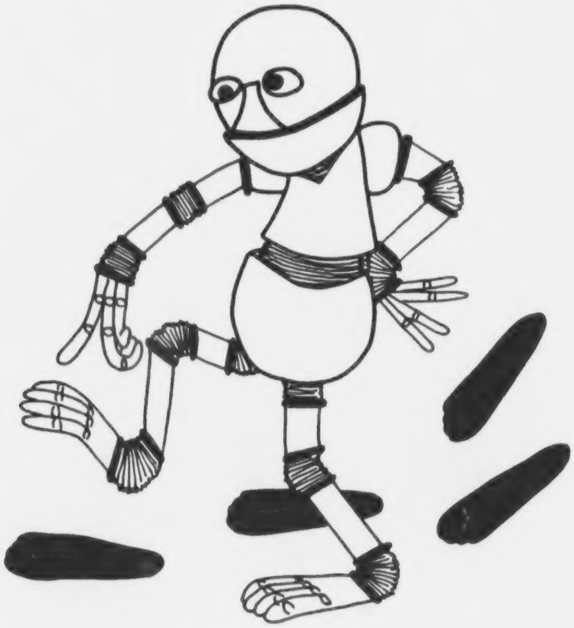
(1)
```
10 PRINT"HELLO"
20 PRINT"THERE"
30 PRINT"BOYS AND GIRLS"
```

(2)
```
10 ?"WELCOME TO"
20 ?"SUNNY"
30 ?"MANITOBA"
```

(3)
```
10 ?"QUESTION #1"
20 ?"16 + 15 ="
30 ?"21"
```

(4)
```
10 ?"THIS"
20 ?"   IS"
30 ?"      DIFFERENT"
```

(5)
```
10 PRINT"HELLO"
20 PRINT
30 PRINT
40 PRINT"GOODBYE"
```



IV-B5-1
Level 1
H-o
P.2 of 2

Solution to "PRINT PREDICTIONS"

```
PROGRAM                                 OUTPUT

(1)  10 PRINT"HELLO"                    HELLO
     20 PRINT"THERE"                    THERE
     30 PRINT"BOYS AND GIRLS"           BOYS AND GIRLS


(2)  10 ?"WELCOME TO"                   WELCOME TO
     20 ?"SUNNY"                        SUNNY
     30 ?"MANITOBA"                     MANITOBA


(3)  10 ?"QUESTION #1"                  QUESTION #1
     20 ?"16 + 15 ="                    16 + 15 =
     30 ?"21"                           21


(4)  10 ?"THIS"                         THIS
     20 ?"    IS"                           IS
     30 ?"      DIFFERENT"                    DIFFERENT


(5)  10 PRINT"HELLO"                    HELLO
     20 PRINT
     30 PRINT
     40 PRINT"GOODBYE"                  GOODBYE
```

IV-B5-2
Level 1
H-o
P.1 of 2

PRINT PROBLEMS

DIRECTIONS:

For each of the following write a program which when RUN will output exactly as shown. RUN each program.

OUTPUT   PROGRAM

```
(1)  I
     AM
     NOT
     BUSY
```

```
(2)  THIS
         IS
           NOT
              SO
                EASY
```

```
(3)  A
         B
             C
         D
     E
```

```
(4)        1
          222
         33333
        4444444
```

```
(5)        *
         *   *
       *       *
       *       *
       *       *
       *********
```

Solution to
"PRINT PROBLEMS"

IV-B5-2
Level 1
H-o
P.2 of 2

OUTPUT / **PROGRAM**

```
(1)  I
     AM
     NOT
     BUSY
```

```
10 ?"I"
20 ?"AM"
30 ?"NOT"
40 ?"BUSY"
```

```
(2)  THIS
         IS
           NOT
              SO
                EASY
```

```
10 ?"THIS"
20 ?"    IS"
30 ?"      NOT"
40 ?"         SO"
50 ?"           EASY"
```

```
(3)  A
         B
             C
         D
     E
```

```
10 ?" A"
20 ?"     B"
30 ?"         C"
40 ?"     D"
50 ?" E"
```

```
(4)         1
           222
          33333
         4444444
```

```
10 ?"   1"
20 ?"  222"
30 ?" 33333"
40 ?"4444444"
```

```
(5)         *
          *   *
        *       *
        *       *
        *       *
        *********
```

```
10 ?"    *"
20 ?"  *   *"
30 ?"*       *"
40 ?"*       *"
50 ?"*       *"
60 ?"*********"
```

PUNCTUATION PREDICTIONS

IV-B5-3
Level 1
H-o
P.1 of 2

DIRECTIONS:

For each of the following programs, indicate the output which will occur when the program is RUN. Show the position of the output.RUN each program. Assume that the screen is cleared at the start of the execution of each new program.

PROGRAM OUTPUT

(1)

```
10 ?"ONE"
20 ?"TWO"
30 ?"THREE"
```

(2)

```
10 ?"ONE";
20 ?"TWO";
30 ?"THREE"
```

(3)

```
10 ?"ONE",
20 ?"TWO",
30 ?"THREE"
```

(4)

```
10 ?"ONE";
20 ?"TWO",
30 ?"THREE"
```

(5)

```
10 ?"ONE"
20 ?"TWO",
30 ?"THREE"
```

IV-B5-3
Level 1
H-o
P.2 of 2

Solution to

"PUNCTUATION PREDICTIONS"

```
PROGRAM                             OUTPUT

(1)  10 ?"ONE"                      ONE
     20 ?"TWO"                      TWO
     30 ?"THREE"                    THREE


(2)  10 ?"ONE";                     ONETWOTHREE
     20 ?"TWO";
     30 ?"THREE"


(3)  10 ?"ONE",                     ONE       TWO       THREE
     20 ?"TWO",
     30 ?"THREE"


(4)  10 ?"ONE";                     ONETWO    THREE
     20 ?"TWO",
     30 ?"THREE"


(5)  10 ?"ONE"                      ONE
     20 ?"TWO",                     TWO       THREE
     30 ?"THREE"
```

PUNCTUATION PROBLEMS

IV-B5-4
Level 2
H-o
P.1 of 2

DIRECTIONS:

For each of the following write a program which when RUN will output exactly as shown. Each of your programs should contain the lines:

```
?"TOM"
?"DICK"
?"HARRY"
```

These lines may be in any order and should use appropriate punctuation. RUN each program.

OUTPUT   PROGRAM

```
(1)  HARRYDICKTOM
```

```
(2)  TOM       DICK       HARRY
```

```
(3)  TOM
     DICKHARRY
```

```
(4)  HARRY       TOMDICK
```

```
(5)  DICK        TOM
     HARRY
```

IV-B5-4
Level 2
H-o
P.2 of 2

Solution to
"PUNCTUATION PROBLEMS"

```
OUTPUT                                      PROGRAM

(1)  HARRYDICKTOM                           10 ?"HARRY";
                                            20 ?"DICK";
                                            30 ?"TOM"


(2)  TOM        DICK        HARRY           10 ?"TOM",
                                            20 ?"DICK",
                                            30 ?"HARRY"


(3)  TOM                                    10?"TOM
     DICKHARRY                              20 ?"DICK";
                                            30 ?"HARRY"


(4)  HARRY        TOMDICK                   10 ?"HARRY",
                                            20 ?"TOM";
                                            30 ?"DICK"


(5)  DICK         TOM                       10 ?"DICK",
     HARRY                                  20 ?"TOM"
                                            30 ?"HARRY
```

LOOP the LOOP

IV-B5-5
Level 2
H-o
P.1 of 2

DIRECTIONS:

For each of the following programs, indicate the output which will occur when the program is RUN. Show the position of the output. RUN each program. Assume that the screen is cleared at the start of the execution of each new program.

PROGRAM

OUTPUT

(1)

```
10 FOR A=1 TO 5
20 PRINT "FIVE"
30 NEXT A
```

(2)

```
10 FOR B=1 TO 5
20 PRINT "ONE"
30 PRINT "TWO"
40 NEXT B
```

(3)

```
10 FOR C=1 TO 7
20 PRINT "SPACE",
30 NEXT C
```

(4)

```
10 FOR D=1 TO 4
20 PRINT "SPACE";
30 NEXT D
```

(5)

```
10 FOR E=1 TO 6
20 PRINT "PRINT"
30 NEXT E
40 PRINT "FINISHED"
```

Solution to
"LOOP the LOOP"

```
PROGRAM                                 OUTPUT

(1)  10 FOR A=1 TO 5                    FIVE
     20 PRINT "FIVE"                    FIVE
     30 NEXT A                          FIVE
                                        FIVE
                                        FIVE


(2)  10 FOR B=1 TO 5                    ONE
     20 PRINT "ONE"                     TWO
     30 PRINT "TWO"                     ONE
     40 NEXT B                          TWO
                                        ONE
                                        TWO
                                        ONE
                                        TWO
                                        ONE
                                        TWO


(3)  10 FOR C=1 TO 7                    SPACE     SPACE     SPACE     SPACE
     20 PRINT "SPACE",                  SPACE     SPACE     SPACE
     30 NEXT C



(4)  10 FOR D=1 TO 4                    SPACESPACESPACESPACE
     20 PRINT "SPACE";
     30 NEXT D



(5)  10 FOR E=1 TO 6                    PRINT
     20 PRINT "PRINT"                   PRINT
     30 NEXT E                          PRINT
     40 PRINT "FINISHED"                PRINT
                                        PRINT
                                        PRINT
                                        FINISHED
```

B-Loop-ers !!

IV-B5-6
Level 2
H-o
P.1 of 2

DIRECTIONS:

For each of the following write a program which when RUN will output exactly as shown. Each program should make use of a FOR-NEXT loop.

OUTPUT

PROGRAM

```
(1)   DOWN
      DOWN
      DOWN
      DOWN
      DOWN
      DOWN
```

```
(2)   OVEROVEROVEROVEROVEROVEROVEROVEROVER
```

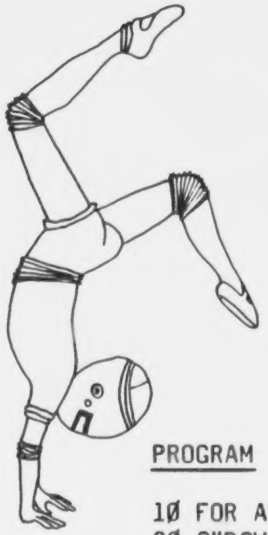
```
(3)   UP
      DOWN
      UP
      DOWN
      UP
      DOWN
```

```
(4)   JUMP      JUMP      JUMP      JUMP
      JUMP      JUMP      JUMP      JUMP
      JUMP      JUMP      JUMP      JUMP
      JUMP      JUMP      JUMP
```

```
(5)   RUN RUN RUN RUN RUN RUN RUN RUN RUN RUN
      RUN RUN RUN STOP
```

IV-B5-6
Level 2
H-o
P.2 of 2

Solution to "B-Loop-ers !!"



OUTPUT / PROGRAM

(1)

```
DOWN
DOWN
DOWN
DOWN
DOWN
DOWN
```

```
10 FOR A=1 TO 6
20 ?"DOWN"
30 NEXT A
```

(2)

```
OVEROVEROVEROVEROVEROVEROVEROVEROVER
```

```
10 FOR B=1 TO 9
20 ?"OVER";
30 NEXT B
```

(3)

```
UP
DOWN
UP
DOWN
UP
DOWN
```

```
10 FOR C=1 TO 3
20 ?"UP"
30 ?"DOWN"
40 NEXT C
```

(4)

```
JUMP      JUMP      JUMP      JUMP
JUMP      JUMP      JUMP      JUMP
JUMP      JUMP      JUMP      JUMP
JUMP      JUMP      JUMP
```

```
10 FOR D=1 TO 15
20 ?"JUMP",
30 NEXT D
```

(5)

```
RUN RUN RUN RUN RUN RUN RUN RUN RUN RUN
RUN RUN RUN STOP
```

```
10 FOR E=1 TO 13
20 ?"RUN ";
30 NEXT E
40 ?"STOP"
```

VARIABLES ON A THEME

IV-B6-1
Level 2
H-o
P.1 of 2

DIRECTIONS:

For each of the following programs, indicate the output which will occur on the screen when the program is RUN. In some cases there may be no output. Assume that the screen is cleared at the start of ech program.

PROGRAM OUTPUT

(1)

```
10 LET A=12
20 LET B=7
30 LET C=A*B
```

(2)

```
10 LET M=10
20 LET N=40
30 LET S=N+M+5
40 PRINT S
```

(3)

```
10 LET X=12
20 LET Y=45
30 LET Z=Y-X
40 PRINT X
50 PRINT Y
60 PRINT Z
```

(4)

```
10 LET P=3*5
20 LET Q=P-7
30 LET R=Q/4
40 PRINT P
50 PRINT Q
60 PRINT R
```

(5)

```
10 LET A=10
20 LET A=A+5
30 LET A=A/3
40 PRINT A
```

Solution to

"VARIABLES ON A THEME"

IV-B6-1
Level 2
H-o
P.2 of 2

```
PROGRAM                               OUTPUT

(1)  10 LET A=12                      No output
     20 LET B=7
     30 LET C=A*B

(2)  10 LET M=10                      55
     20 LET N=40
     30 LET S=N+M+5
     40 PRINT S

(3)  10 LET X=12                      12
     20 LET Y=45                      45
     30 LET Z=Y-X                     33
     40 PRINT X
     50 PRINT Y
     60 PRINT Z

(4)  10 LET P=3*5                     15
     20 LET Q=P-7                     8
     30 LET R=Q/4                     2
     40 PRINT P
     50 PRINT Q
     60 PRINT R

(5)  10 LET A=10                      5
     20 LET A=A+5
     30 LET A=A/3
     40 PRINT A
```

USING VARIABLES

IV-B6-2
Level 2
H-o
P.1 of 2

DIRECTIONS:

For each of the following problems write a program which will perform the indicated arithmetic operation(s). Assign variables and print the answer.

PROBLEM	PROGRAM
(1) $45+76$	
(2) $45/15 + 12$	
(3) $12+12+12+12+12+12+12$	
(4) $2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2$	
(5) 12 times the sum of 14 and 65.	

Solution to "USING VARIABLES"

IV-B6-2
Level 2
H-o
P.2 of 2

	PROBLEM	PROGRAM
(1)	45+76	10 LET A=45 20 LET B=76 30 ?A+B
(2)	45/15 + 12	10 LET A=45 20 LET B=15 30 LET C=12 40 ?A/B+C
(3)	12+12+12+12+12+12+12	10 LET A=12 20 ?7*A
(4)	2x2x2x2x2x2x2x2x2x2x2x2	10 LET A=2 20 ?A↑12
(5)	12 times the sum of 14 and 65.	10 LET A=12 20 LET B=14 30 LET C=65 40 ?A*(B+C)

IV-B6-3
Level 2
H-o
P.1 of 2

LOOPS II

DIRECTIONS:

For each of the following programs, indicate the output which will result on the screen when the program is RUN. Show the position of the output. RUN each program. Assume in each case that the screen is cleared at the beginning of each new program.

PROGRAM OUTPUT

```
(1)  10 FOR A=1 TO 6
     20 PRINT A
     30 NEXT A
     40 PRINT "THAT'S ALL"
```

```
(2)  10 PRINT "START"
     20 FOR B=1 TO 4
     30 PRINT B
     40 NEXT B
     50 PRINT "FINISH"
```

```
(3)  10 FOR C=1 TO 4
     20 PRINT C
     30 PRINT "MANITOBA"
     40 NEXT C
```

```
(4)  10 FOR D=1 TO 9
     20 LET Z=D*D
     30 PRINT D,Z
     40 NEXT D
```

```
(5)  10 FOR E=15 TO 20
     20 PRINT E;" + 25 ="
     30 PRINT E+25
     40 PRINT
     50 NEXT E
```

Solution to
"LOOPS II"

IV-B6-3
Level 2
H-o
P.2 of 2

```
PROGRAM                                   OUTPUT

(1)  10 FOR A=1 TO 6                      1
     20 PRINT A                           2
     30 NEXT A                            3
     40 PRINT "THAT'S ALL"                4
                                          5
                                          6
                                          THAT'S ALL

(2)  10 PRINT "START"                     START
     20 FOR B=1 TO 4                      1
     30 PRINT B                           2
     40 NEXT B                            3
     50 PRINT "FINISH"                    4
                                          FINISH

(3)  10 FOR C=1 TO 4                      1
     20 PRINT C                           MANITOBA
     30 PRINT "MANITOBA"                  2
     40 NEXT C                            MANITOBA
                                          3
                                          MANITOBA
                                          4
                                          MANITOBA

(4)  10 FOR D=1 TO 9                      1         1
     20 LET Z=D*D                         2         4
     30 PRINT D,Z                         3         9
     40 NEXT D                            4         16
                                          5         25
                                          6         36
                                          7         49
                                          8         64
                                          9         81

(5)  10 FOR E=15 TO 20                    15 + 25 =
     20 PRINT E;" + 25 ="                 40
     30 PRINT E+25                        16 + 25 =
     40 PRINT                             41
     50 NEXT E                            17 + 25 =
                                          42
                                          18 + 25 =
                                          43
                                          19 + 25 =
                                          44
                                          20 + 25 =
                                          45
```

...and FOR the NEXT Loop...

IV-B6-4
Level 3
H-o
P.1 of 2

DIRECTIONS:

For each of the following problems write a program which will perform the indicated task. Each program should include a FOR-NEXT loop.

PROBLEM PROGRAM

(1) Count from 1 to 75 on the screen.

(2) Count from 100 to 200 on the screen.

(3) Print HELLO and count it 25 times.
In other words,

```
 1
HELLO
 2
HELLO
 3
HELLO
etc.
```

(4) Print the squares of all numbers from 1 to 100 on the screen.

(5) Print your name enough times to fill the screen.

Solution to
"...and FOR the NEXT Loop..."

IV-B6-4
Level 3
H-o
P.2 of 2

	PROBLEM	PROGRAM
(1)	Count from 1 to 75 on the screen.	10 FOR X=1 TO 75 20 ?X 30 NEXT X
(2)	Count from 100 to 200 on the screen.	10 FOR X=100 TO 200 20 ?X 30 NEXT X
(3)	Print HELLO and count it 25 times. In other words, 1 HELLO 2 HELLO 3 HELLO etc.	10 FOR X=1 TO 25 20 ?X 30 ?"HELLO" 40 NEXT X
(4)	Print the squares of all numbers from 1 to 100 on the screen.	10 FOR X=1 TO 100 20 ?X↑2 30 NEXT X
(5)	Print your name enough times to fill the screen.	10 FOR X=1 TO 250 20 ?"NAME"; 30 NEXT X The upper number (250) will vary with the length of your name.

STRINGING ALONG

IV-B6-5
Level 2
H-o
P.1 of 2

DIRECTIONS:

For each of the following programs, indicate the output which will result when the program is RUN. Show the position of the output. Assume in each case that the screen is cleared at the start of each new program.

PROGRAM | OUTPUT

(1)

```
10 LET A$ ="ONE"
20 LET B$ ="TWO"
30 LET C$ ="THREE"
40 PRINT B$
50 PRINT A$
60 PRINT C$
```

(2)

```
10 LET D$ ="HER"
20 LET E$ ="FAT"
30 PRINT E$;
40 PRINT D$
```

(3)

```
10 LET K$ ="ONE"
20 LET L$ ="TWO"
30 LET M$ ="THREE"
40 PRINT M$;K$;L$
```

(4)

```
10 LET X$ ="TEN"
20 LET Y$ ="FOUR"
30 LET Z$ ="TWO"
40 PRINT X$,Z$,Y$
```

(5)

```
10 LET P$ ="COMPUTER"
20 FOR C=1 TO 10
30 PRINT C;P$
40 NEXT C
```

Solution to "STRINGING ALONG"

```
PROGRAM                                 OUTPUT

(1)  10 LET A$ ="ONE"                   TWO
     20 LET B$ ="TWO"                   ONE
     30 LET C$ ="THREE"                 THREE
     40 PRINT B$
     50 PRINT A$
     60 PRINT C$

(2)  10 LET D$ ="HER"                   FATHER
     20 LET E$ ="FAT"
     30 PRINT E$;
     40 PRINT D$

(3)  10 LET K$ ="ONE"                   THREEONETWO
     20 LET L$ ="TWO"
     30 LET M$ ="THREE"
     40 PRINT M$;K$;L$

(4)  10 LET X$ ="TEN"                   TEN       TWO       FOUR
     20 LET Y$ ="FOUR"
     30 LET Z$ ="TWO"
     40 PRINT X$,Z$,Y$

(5)  10 LET P$ ="COMPUTER"              1 COMPUTER
     20 FOR C=1 TO 10                   2 COMPUTER
     30 PRINT C;P$                      3 COMPUTER
     40 NEXT C                          .    .
                                        .    .
                                        .    .
                                        10 COMPUTER
```

IV-B6-6
Level 3
H-o
P.1 of 2

ALL STRUNG OUT

DIRECTIONS:

For each of the following problems, write a computer program which assigns the appropriate words (COMPUTERS, ARE, and FUN) to string variables to produce the indicated output.

OUTPUT

PROGRAM

```
(1)  COMPUTERS
     ARE
     FUN
```

```
(2)  COMPUTERS ARE      FUN
```

```
(3)  ARE       COMPUTERS FUN
```

```
(4)  COMPUTERS
     ARE       FUN
```

```
(5)  COMPUTERS

     ARE

     FUN
```

Solution to "ALL STRUNG OUT"

IV-B6-6
Level 3
H-o
P.2 of 2

```
OUTPUT                                  PROGRAM

(1)  COMPUTERS                          10 LET A$="COMPUTERS"
     ARE                                20 LET B$="ARE"
     FUN                                30 LET C$="FUN"
                                        40 ?A$
                                        50 ?B$
                                        60 ?C$

(2)  COMPUTERS ARE      FUN             10 LET A$="COMPUTERS"
                                        20 LET B$="ARE"
                                        30 LET C$="FUN"
                                        40 ?A$;" ";B$,C$

(3)  ARE       COMPUTERS FUN            10 LET A$="COMPUTERS"
                                        20 LET B$="ARE"
                                        30 LET C$="FUN"
                                        40 ?B$,A$;" ";C$

(4)  COMPUTERS                          10 LET A$="COMPUTERS"
     ARE       FUN                      20 LET B$="ARE"
                                        30 LET C$="FUN"
                                        40 ?A$
                                        50 ?B$,C$

(5)  COMPUTERS                          10 LET A$="COMPUTERS"
                                        20 LET B$="ARE"
     ARE                                30 LET C$="FUN"
                                        40 ?A$
     FUN                                50 ?
                                        60 ?B$
                                        70 ?
                                        80 ?C$
```

I/O... I/O...

IV-B6-7
Level 2
H-o
P.1 of 2

DIRECTIONS:

Each of the following programs responds to some INPUT. In each case you are to state the INPUT used, then to show the output which will occur on the screen. Assume that the screen is cleared at the start of each new program.

PROGRAM INPUT OUTPUT

```
(1)  10 PRINT"TYPE A NAME"
     20 INPUT N$
     30 FOR A=1 TO 5
     40 PRINT N$
     50 NEXT A

(2)  10 PRINT "TYPE A NUMBER"
     20 INPUT N
     30 PRINT N+15

(3)  10 PRINT "TYPE A WORD"
     20 INPUT W$
     30 FOR C=1 TO 7
     40 ?W$;
     50 NEXT C

(4)  10 PRINT "TYPE A NUMBER"
     20 INPUT N
     30 PRINT"TYPE YOUR NAME"
     40 INPUT N$
     50 FOR Z=1 TO N
     60 PRINT N$
     70 NEXT Z

(5)  10 PRINT "TYPE YOUR AGE"
     20 INPUT A
     30 PRINT "TYPE YOUR NAME"
     40 INPUT N$
     50 PRINT "HELLO,  ";N$
     60 PRINT "YOU ARE";A;"YEARS OLD"
```

228

Solution to "I/O... I/O..."

IV-B6-7
Level 2
H-o
P.2 of 2

Output may vary with the microcomputer being used.

```
PROGRAM                                INPUT          OUTPUT

(1)  10 PRINT"TYPE A NAME"             TOM            TOM
     20 INPUT N$                                      TOM
     30 FOR A=1 TO 5                                  TOM
     40 PRINT N$                                      TOM
     50 NEXT A                                        TOM

(2)  10 PRINT "TYPE A NUMBER"          374            389
     20 INPUT N
     30 PRINT N+15

(3)  10 PRINT "TYPE A WORD"            GO             GOGOGOGOGOGOGO
     20 INPUT W$
     30 FOR C=1 TO 7
     40 ?W$;
     50 NEXT C

(4)  10 PRINT "TYPE A NUMBER"          7              TOM
     20 INPUT N                        TOM            TOM
     30 PRINT"TYPE YOUR NAME"                         TOM
     40 INPUT N$                                      TOM
     50 FOR Z=1 TO N                                  TOM
     60 PRINT N$                                      TOM
     70 NEXT Z                                        TOM

(5)  10 PRINT "TYPE YOUR AGE"          14             HELLO, MARY
     20 INPUT A                        MARY           YOU ARE 14 YEARS OLD
     30 PRINT "TYPE YOUR NAME"
     40 INPUT N$
     50 PRINT "HELLO,  ";N$
     60 PRINT "YOU ARE";A;"YEARS OLD"
```

INPUT PROBLEMS

IV-B6-8
Level 3
H-o
P.1 of 1

DIRECTIONS:

For each of the following problems write a BASIC program which will perform the indicated task.

(1) Accept a name as INPUT and PRINT it 10 times on the screen.

(2) Accept a number as INPUT and PRINT it on the screen 500 times.

(3) Accept a number as INPUT and PRINT on the screen the word COMPUTER the input number of times.

(4) Accept your name, age and school as INPUT and PRINT them on the screen as shown:

```
MY AGE IS ??.
MY NAME IS ???????.
I GO TO ???????????? SCHOOL.
```

(5) Accept any number as INPUT and PRINT on the screen all its multiples 50 times. For example, an input of 5 outputs 5 10 15 20 25......250.

IFfy PROGRAMS

IV-B6-9
Level 2
H-o
P.1 of 2

DIRECTIONS:

For each of the following programs, provide the output which will occur when the program is RUN using the indicated INPUT.

(1)

```
10 PRINT "TYPE YOUR NAME"
20 INPUT N$
30 IF N$="PETE" THEN 60
40 PRINT"HAPPY TO MEET YOU, ";N$
50 GOTO 70
60 PRINT "I KNOW YOU, ";N$
70 END
```

Input Output

a) TOM ______________________

PETE ______________________

PETER ______________________

(2)

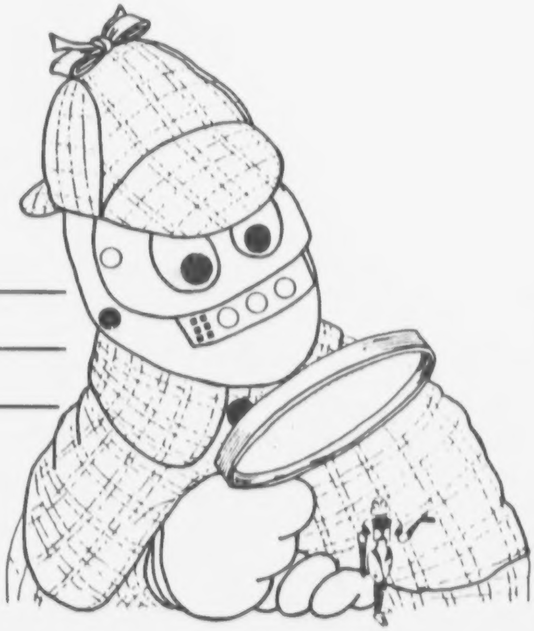
```
10 PRINT "TYPE YOUR AGE"
20 INPUT X
30 IF X>=13 THEN 60
40 PRINT "INTERESTING!"
50 END
60 PRINT "THAT'S NICE!"
```

Input Output

a) 17 ______________________

b) 13 ______________________

c) 9 ______________________



Solution to
"IFfy PROGRAMS"

(1)

```
10 PRINT "TYPE YOUR NAME"
20 INPUT N$
30 IF N$="PETE" THEN 60
40 PRINT"HAPPY TO MEET YOU, ";N$
50 GOTO 70
60 PRINT "I KNOW YOU, ";N$
70 END
```

	Input	Output
a)	TOM	HAPPY TO MEET YOU, TOM
	PETE	I KNOW YOU, PETE
	PETER	HAPPY TO MEET YOU, PETER

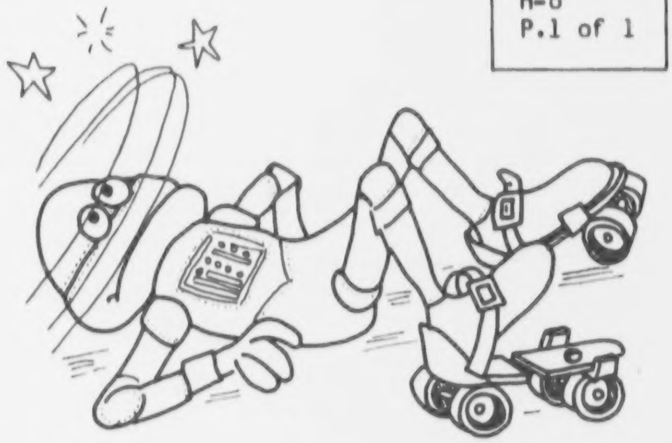
(2)

```
10 PRINT "TYPE YOUR AGE"
20 INPUT X
30 IF X>=13 THEN 60
40 PRINT "INTERESTING!"
50 END
60 PRINT "THAT'S NICE!"
```

	Input	Output
a)	17	THAT'S NICE!
b)	13	THAT'S NICE!
c)	9	INTERESTING!

IV-B6-10
Level 3
H-o
P.1 of 1

IFfy PROBLEMS



DIRECTIONS:

For each of the following problems write a program which when RUN performs the indicated task.

(1) Allows INPUT of a number. The program should respond LARGE for numbers over 100, otherwise it prints SMALL.

(2) Allows INPUT of a number. The program should respond:

ADULT for over 18
NEW VOTER for 18
NOT YET! for all others.

(3) Write a program which will ask for a pizza topping as INPUT and then will respond:

SWEET TOOTH!	for pineapple
CANADIAN, EH!	for back bacon
P.U.!	for anchovy
HOT STUFF	for pepperoni
SMURF HOUSE!	for mushroom
SORRY, NOT FOR SALE HERE!	for anything else

STEPping OUT

IV-B7-1
Level 3
H-o
P.1 of 1

DIRECTIONS:

For each of the following programs indicate the output which will result when the program is RUN.

PROGRAM

OUTPUT

(1)
```
10 FOR A=1 TO 21 STEP 2
20 PRINT A;
30 NEXT A
```

(2)
```
10 FOR B=25 TO 50 STEP 5
20 PRINT B;
30 NEXT B
```

(3)
```
10 FOR C=-4 TO 12 STEP 3
20 PRINT C;
30 NEXT C
```

(4)
```
10 FOR D=20 TO -10 STEP -5
20 PRINT D;
30 NEXT D
```

(5)
```
10 FOR E=0 TO 1.5 STEP .2
20 PRINT E;
30 NEXT E
```

STEP PROBLEMS

IV-B7-2
Level 3
H-o
P.1 of 2

DIRECTIONS:

For each of the following problems write a program which will produce the indicated screen output. Use a FOR-NEXT loop.

(1) 0 4 8 12 16 20 24

(2) 19 17 15 . . . 1

(3) All odd numbers between 8 and 50.

(4) Positive multiples of 6 under 100.

(5) 2.1 1.6 1.1 . . . -2.1

(6) Design a program using a FOR-NEXT loop which prints out the verses of the following song.

"10 green bottles, sitting on the wall"
"10 green bottles, sitting on the wall"
"And if 1 green bottle should accidentally fall,"
"There would be 9 green bottles sitting on the wall."

It may be necessary to insert a FOR-NEXT loop such as FOR P=1 TO 1000: NEXT P to pause or delay between successive verses.

Solution to "STEP PROBLEMS"

IV-B7-2
Level 3
H-o
P.2 of 2

(1) 0 4 8 12 16 20 24

```
10 FOR X=0 TO 24 STEP 4
20 ?X;
30 NEXT X
```

(2) 19 17 15 . . . 1

```
10 FOR X=19 TO 1 STEP -2
20 ?X;
30 NEXT X
```

(3) All odd numbers between 8 and 50.

```
10 FOR X=7 TO 50 STEP 2
20 ?X;
30 NEXT X
```

(4) Positive multiples of 6 under 100.

```
10 FOR X=1 TO 100/6
20 ?X*6
30 NEXT X
```

(5) 2.1 1.6 1.1 . . . -2.1

```
10 FOR X=2.1 TO -2.1 STEP -.5
20 ?X;
30 NEXT X
```

(6) Design a program using a FOR-NEXT loop which prints out the verses of the following song.

"10 green bottles, sitting on the wall"
"10 green bottles, sitting on the wall"
"And if 1 green bottle should accidentally fall,"
"There would be 9 green bottles sitting on the wall."

It may be necessary to insert a FOR-NEXT loop such as FOR P=1 TO 1000: NEXT P to pause or delay between successive verses.

```
10 FOR X=0 TO 9
20 ?10-X;"GREEN BOTTLES, SITTING ON THE WALL"
30 ?10-X;"GREEN BOTTLES, SITTING ON THE WALL"
40 "AND IF 1 GREEN BOTTLE SHOULD ACCIDENTALLY FALL"
50 "THERE WOULD BE ";9-X;"GREEN BOTTLES SITTING ON THE WALL"
60 FOR P=1 TO 1000:NEXT P
70 NEXT X
```

READing DATA

IV-B7-3
Level 3
H-o
P.1 of 2

DIRECTIONS:

For each of the following programs, indicate the output which will result when the program is RUN.

PROGRAM

OUTPUT

(1)
```
10 READ A
20 READ B
30 READ C$
40 PRINT A,B,C$
50 DATA 1,2,"THREE",4,5,"SIX"
```

(2)
```
10 READ A$,B$,C$,D$
20 PRINT D$
30 PRINT C$
40 PRINT A$
60 DATA"HARD","MUCH","IS","THIS","THAT"
```

(3)
```
10 FOR X=1 TO 5
20 READ N
30 PRINT N
40 NEXT X
50 DATA 12, 75, 16, 9, 8, 0, 2, 19
```

(4)
```
10 FOR X=1 TO 5
20 READ N,A
30 PRINT A
40 NEXT X
50 DATA 4, 1, 9, 3, 6, 5, 3, 7, 12, 9
```

(5)
```
10 FOR K=1 TO 3
20 READ X$, Y$
30 PRINT X$
40 NEXT K
50 DATA"COMPUTERS","USUALLY","ARE","NOT","FUN","FOR","ME"
```

Solution to "READing DATA"

IV-B7-3
Level 3
H-o
P.2 of 2

```
PROGRAM                                                OUTPUT

(1)  10 READ A                                         1       2       THREE
     20 READ B
     30 READ C$
     40 PRINT A,B,C$
     50 DATA 1,2,"THREE",4,5,"SIX"


(2)  10 READ A$,B$,C$,D$                               THIS
     20 PRINT D$                                       IS
     30 PRINT C$                                       HARD
     40 PRINT A$
     60 DATA"HARD","MUCH","IS","THIS","THAT"


(3)  10 FOR X=1 TO 5                                   12
     20 READ N                                         75
     30 PRINT N                                        16
     40 NEXT X                                         9
     50 DATA 12, 75, 16, 9, 8, 0, 2, 19                8


(4)  10 FOR X=1 TO 5                                   1
     20 READ N,A                                       3
     30 PRINT A                                        5
     40 NEXT X                                         7
     50 DATA 4, 1, 9, 3, 6, 5, 3, 7, 12, 9             9


(5)  10 FOR K=1 TO 3                                   COMPUTERS
     20 READ X$, Y$                                    ARE
     30 PRINT X$                                       FUN
     40 NEXT K
     50 DATA"COMPUTERS","USUALLY","ARE","NOT","FUN","FOR","ME"
```

READing more DATA

IV-B7-4
Level 3
H-o
P.1 of 1

DIRECTIONS:

For each of the following problems, write a program containing the READ/ DATA statement which will produce the indicated screen output.

(1) READ these 10 items from DATA and arrange as shown.

```
A     1
B     2
C     3
D     4
E     5
```

(2) Tabulate homonyms as pairs. For example:

```
SEA      SEE
THERE    THEIR
RED      READ
```

(3) Arrange the English word, the numeral and the French word as shown.

```
one       1      un
two       2      deux
three     3      trois
four      4      quatre
five      5      cinq
six       6      six
seven     7      sept
```

IV-L2-1
Levels 1,2,3
Lo/H-o
P.1 of 3

LOGO
LOG BOOK

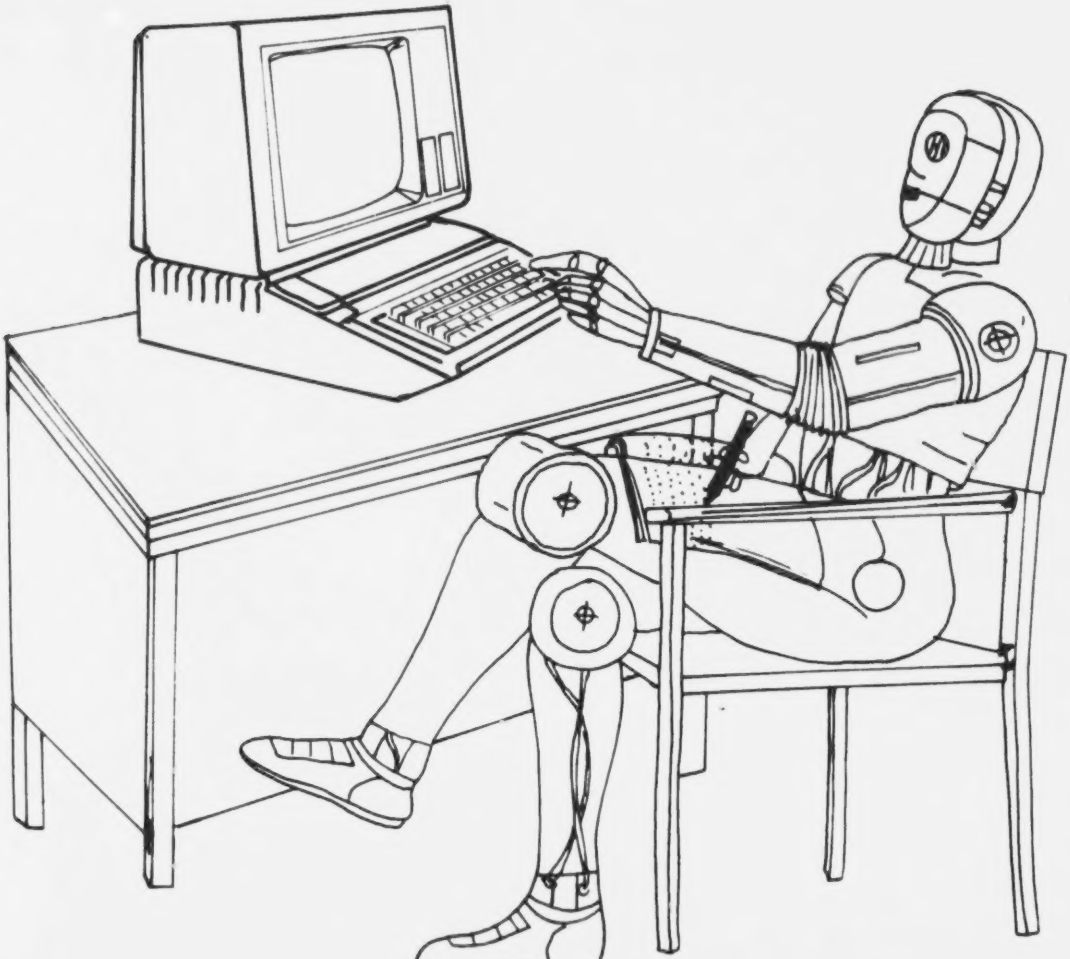


TABLE
OF
PROCEDURES

IV-L2-1
Levels 1,2,3
Lo/H-o
P.2 of 3

NAME OF PROCEDURE	DESCRIPTION

IV-L2-1
Levels 1,2,3
Lo/H-o
P.3 of 3

DESIGN

Original Plan

Revised Plan

IV-L3-1
Level 1
Lo/H-o/Ma
P.1 of 2

CLOSED SHAPES

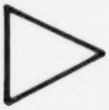
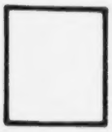
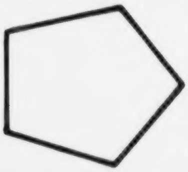
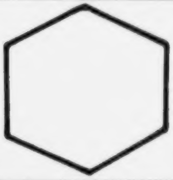
DIRECTIONS:

Complete the table below. For each closed shape give the geometric name, the number of sides, and the repeat command that will create the shape.

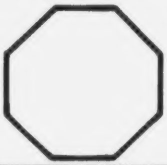
1. Count the number of sides in the polygon and record the number on the table.

2. Determine the number of repeats required to produce the number of sides in the polygon.

3. Experiment with the size of the angle until the sides of the shape are closed.

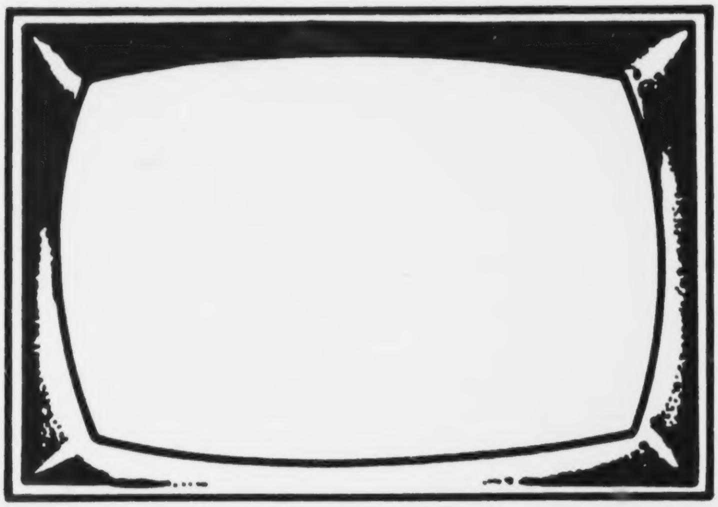
SHAPE	NAME OF POLYGON	NUMBER OF SIDES	REPEAT COMMAND
			REPEAT _ [FD 40 RT _]
			REPEAT _ [FD 40 RT _]
			
			

IV-L3-1
Level 1
Lo/H-o/Ma
P.2 of 2

SHAPE	NAME OF POLYGON	NUMBER OF SIDES	REPEAT COMMAND
			
CREATE TWO OTHER CLOSED POLYGONS OF YOUR OWN CHOICE			
CREATE THE LARGEST TRIANGLE POSSIBLE WITHOUT GOING OFF THE SCREEN			
CREATE THE LARGEST OCTAGON POSSIBLE WITHOUT GOING OFF THE SCREEN			

PROCEDURE PLANNING

IV-L4-1
Levels 1,2,3
Lo/H-o
P.1 of 1



Procedure Plan	Final Procedure

MARTIN'S MYSTERY

DIRECTIONS:

The teacher could begin this activity by conducting a class demonstration.

1. Demonstrate how to load the word processing software into the computer.
2. Explain the difference between the word processing software and the documents (called data files) stored on data diskettes.
3. Outline the menu structure of the word processor and the procedures which must be used to access and load the data file called LETTER. These instructions could be displayed on a poster near the computer or handed out individually to students.
4. Provide a schedule and time for each pair of students to access the LETTER and the eight clues (data files CLUE1, CLUE2, . . ., CLUE8) and to discover MARTIN.

DIRECTIONS:

The teacher should create the following ten data files using the word processor and then should save them on a data diskette.

1. File #1
Name: LETTER

Dear Friends:
I'm lost in the land of Floppidisco.
Floppidisco's a funny place.
I feel as if I'm in outer space.
If you can find my hidden face,
Then you will set me free!
I'll give you clues to find my site.
Write them down--make sure they're right!
Then think and think with all your might, and you will set me free!

Signed,
MARTIN

2. File #2
Name: CLUE1

CLUE1:
Write the following letters on a piece of paper. They are clues to help you find Martin!
M I D

Now retrieve CLUE2.

3. File #3
Name: CLUE2

CLUE2:
Write the following letters on a piece of paper. They are clues to help you find Martin!
E N I

Retrieve CLUE3

4. File #4

CLUE3:
Write the following clue on a piece of paper. It will help you find Martin!
THE ? IS AN "A."

Retrieve CLUE4.

5. File #5

CLUE4:
Write the following on a piece of paper. They are clues to help you find Martin!
I E A L E

Retrieve CLUE5

7. File #7

CLUE6:
Write the following letters on a piece of paper. They are clues to help you find Martin!
M R I N I D M Y

Retrieve CLUE7.

iece
to help

s on a
clues

6. File #6

CLUE5:
On a piece of paper, write the sentence below. It's a clue to help you find Martin!
I'-/H-D---/-N/?/F-L-/C--L-D/-
A-T--. F-N-/-E/IF/---/-A-!

Retrieve CLUE6.

8. File #8

CLUE7:
Write the following letters on a piece of paper. They are clues to help you find MARTIN!
O U C N

Retrieve CLUE8.

9. File #9
Name: CLUE8

CLUE8:
THIS IS YOUR LAST CLUE!
Put the letters you have written in the blank spaces in the sentence from CLUE5. Be sure to put them in the order you uncovered them.
CLUE3 is a special clue.
GOOD LUCK!

10. File #10
Name: MARTIN

```
  !!!!
 !!!!!!
 0   0
   7
  ---
```

Hi! I'm Martin! Thanks for setting me free. . . .

EXTENSIONS:

- Have students design their own mystery which can be stored on the data diskette for use at a later time.

(Courtesy Scholastic-TAB Publications, from Boudrot, T.E., Word Processing Primer, Teaching and Computers, March, 1984.)

THE A-MAZE-ING CURSOR

IV-T1-2
Level 1
TU
P.1 of 2

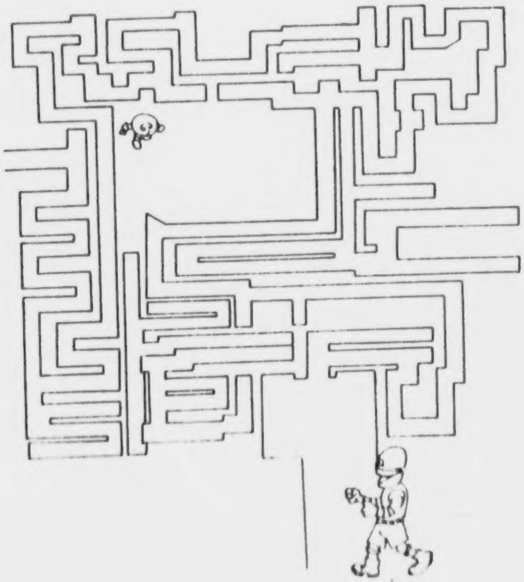
DIRECTIONS:

1. Before beginning this activity, use your word processing program to create a screen full of dots (periods).
2. Save this grid on a data diskette under the name GRID.
3. Make a transparency of the maze found on the next page, or create one of your own.
4. At the beginning of this activity, review how to load your word processor. Demonstrate to the class how to move the cursor from side to side, from top to bottom, and in accelerated speed.
5. Provide a schedule and time for each pair of students to load the GRID file, tape the transparency maze to the screen, and to manipulate the cursor through this maze from START to FINISH.

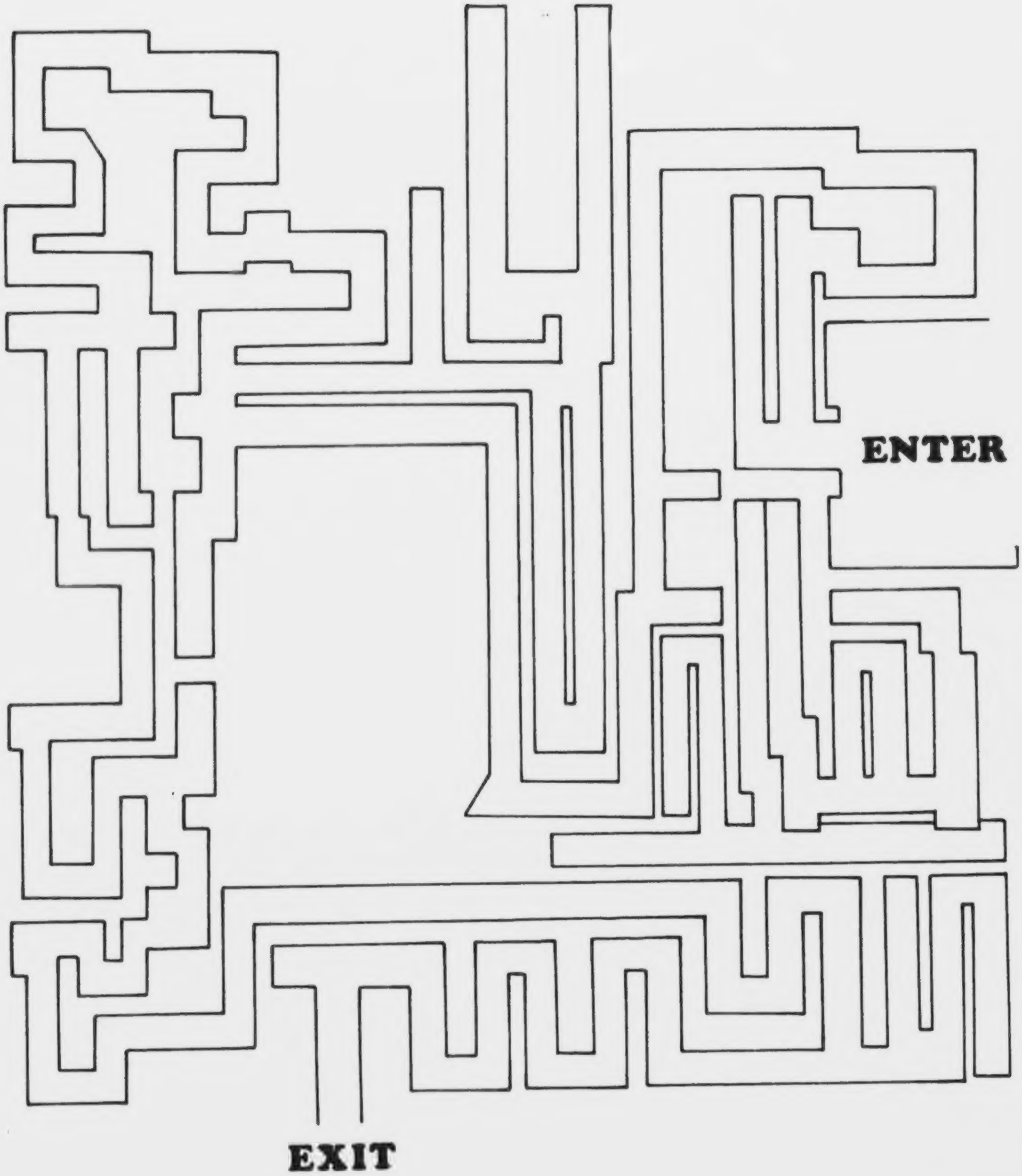
250

EXTENSIONS:

- Have students move through the maze from FINISH to START.
- Have students create their own mazes and challenge other students to solve them.



IV-T1-2
Level 1
TU
P.2 of 2



WHICH WITCH ?

IV-T1-3
Level 1
TU
P.1 of 2

DIRECTIONS:

1. The teacher should create and store a file called WITCH, found on the following page, on a data diskette using the word processor.
   NOTE: Even the DIRECTIONS to the students should be stored in this file.

2. The teacher should outline and demonstrate to the class, the procedures for deleting characters and words by eliminating the first incorrect homonym in the WITCH file.

3. Each pair of students should be provided with a schedule and time to access the file WITCH, to complete the exercise, and to store the revised file under a new name; for example, their initials, on the same data diskette and, if possible, to print it out on the printer.

4. The teacher can check each student's work by loading the individual files or by checking the printouts.

252

IV-T1-3
Level 1
TU
P.2 of 2

DIRECTIONS:

Move the cursor to the homonyms in this story. Delete the incorrect one. Only the homonym that fits the story should remain.

Belinda is a WHICH/WITCH. She's not YOUR/YOUR'RE ordinary WITCH/WHICH, however. FOUR/FOR example, Belinda eats only PEARS/PAIRS and READ/RED MEAT/MEET. Her HAIR/HARE is DIED/DYED purple and her skin is very PALE/PAIL.

When Belinda comes to visit, her pet BEAR/BARE, Jonathon, always tags along. THERE/THEY'RE quite a couple! My neighbors do NOT/KNOT believe the SIGHT/SITE--a BARE/BEAR and a WITCH/WHICH walking up to my door?! Surely the SUN/SON must be too strong!

(Courtesy Scholastic-TAB Publications, from Boudrot, T.E., Word Processing Primer, Teaching and Computers, March, 1984.)

LETTER FROM CAMP

IV-T1-4
Level 1
TU
P.1 of 4

DIRECTIONS:

1. The teacher should create and store a data file called CAMP, as found on the following page, on a data diskette using the word processor. NOTE: Even the DIRECTIONS to the students should be stored in this file.

2. The teacher should review with the class, the definitions of various parts of speech and of the tenses.

3. Teachers should reproduce and distribute the student worksheet from the following page.

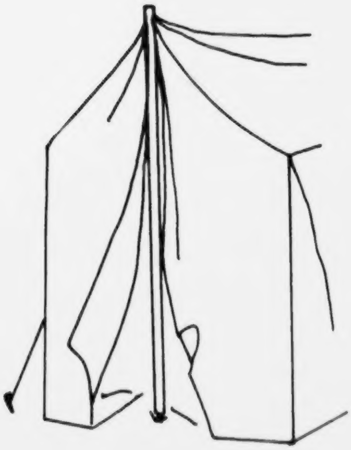
4. Students should complete the worksheet by selecting any word that fits the categories specified.

5. The teacher should prepare reference cards outlining the proper procedures for inserting and replacing text and should tape the card to each monitor.

6. The teacher should outline and demonstrate to the class, the procedures for inserting and replacing text by replacing the first category labelled (person) on the data file "Letter From Camp".

7. Each pair of students should be provided with a schedule and time to access the file CAMP, to complete the exercise, and to store the revised file under a new name (for example, their initials) on the same data diskette. And if possible, print it out on the printer.

8. The teacher can check each student's work by loading the individual files or by checking printouts.



IV-T1-4
Level 1
TU
P.3 of 4

DIRECTIONS:

Replace the words in parentheses with the corresponding words which you have written on your worksheet.

Dear (person),

I finally made it to (place), and boy is it interesting. When we arrived, a huge (animal) charged toward our bus. We nearly (verb, past tense).

On the second day, (person) went for a (verb) in the woods. After (number) hours, we became worried and formed a search party. By midnight, we became (adjective) and returned to the cabin. And--I'll bet you've guessed--(person) was asleep in bed!

The food is (adjective). The only thing we ate on (date) was (vegetable). The camp director said that it was good for us. You know how much I like (vegetable).

We will be coming home on (date). Please pick me up at (place). Oh, by the way, don't forget to bring along some (favorite candy)!

Your (son/daughter),

(Your name)

IV-T1-4
Level 1
TU
P.4 of 4

STUDENT WORKSHEET

Name ______________________________

DIRECTIONS:

Select words that fit each category below. Write one word on each line. Then, using the word processor, complete the story with the file-name CAMP using the words you have written.

1. person ______________________________
2. place ______________________________
3. animal ______________________________
4. verb (past tense) __________________
5. person ______________________________
6. verb ______________________________
7. number ______________________________
8. adjective ____________________________
9. person ______________________________
10. adjective ____________________________
11. date ______________________________
12. vegetable ____________________________
13. vegetable ____________________________
14. date ______________________________
15. place ______________________________
16. favorite candy ______________________
17. son/daughter (Pick one) _____________
18. your name ____________________________

(Courtesy Scholastic-TAB Publications, from Boudrot, T.E., Word Processing Primer, Teaching and Computers, March, 1984.)

LAST WILL AND TESTAMENT

IV-T1-5
Level 1
TU
P.1 of 3

DIRECTIONS:

1. Before beginning this activity the teacher should use the word processor software to enter Uncle Morris's Will which is found below. The text should be saved in a data file called MORRIS.

I, Morris Q. Moneybucks, being of rich mind and body, leave my earthly possessions to my three children: Doris, Horace, and Chloris.

To Doris: three pink china teacups, one moose head, one dozen candles, contents of the main library, seven umbrellas, and my brass doorknob.

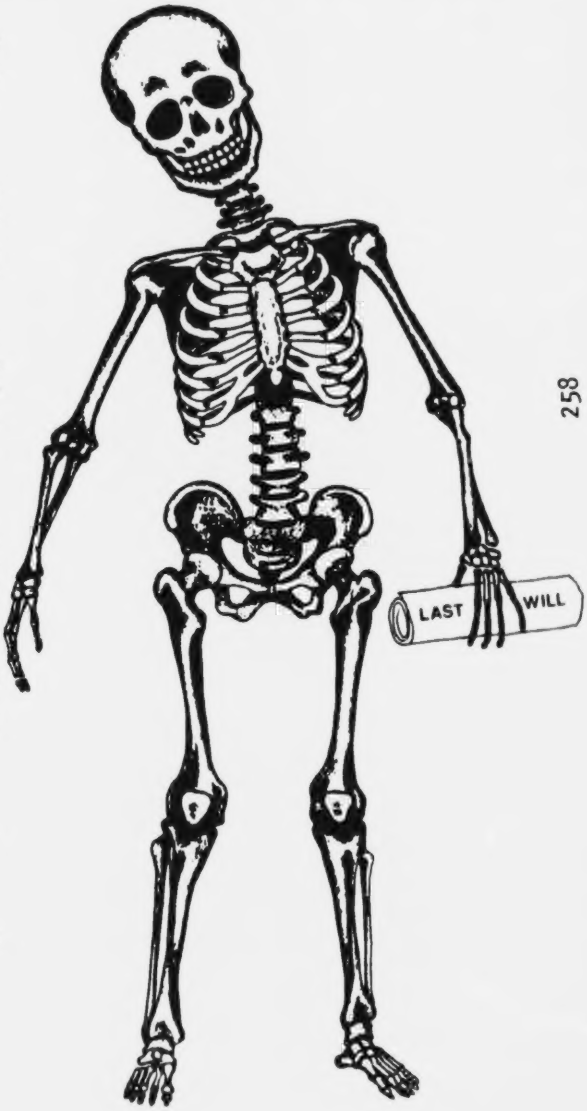
To Horace: one Rolls Royce (tires not included) one guitar (stringless), two pink china teacups (cracked), carving set (dull), and my old toothbrush.

To Chloris: twenty assorted sewing machines, five photograph records, one phonograph, one pair of tennis shoes, and my teddy bear.

If anyone fails to collect the loot within 30 days of my departure, it will be given to my faithful butler, Max.

Signed,

MORRIS Q. MONEYBUCKS



2. Sets of task cards, which are identified below, might be duplicated for class members. As an alternative, teachers may wish to prepare these task cards on overhead transparencies.

Card 1

Uncle Morris forgot to check the attic before he wrote his will. Add these items:
DORIS: one stuffed duck, two pairs of slippers, nine baseball bats
HORACE: two antique clocks (slow), one window shade (torn)
CHLORIS: three bedposts

Card 2

After much thinking, Uncle Morris has decided to make a few changes in the original will.

It's up to you to put them in the will.
DORIS: Change "seven umbrellas" to "one waffle iron."
HORACE: Change "one guitar" to "eight seashells by the seashore."
CHLORIS: Change "my teddy bear" to "my hot pink socks."

Card 3

Before Uncle Morris passed away, he fixed all his broken items.

Correct the will by deleting all words in parentheses.

While you're at it, you might as well get rid of Doris's moose head and Horace's old toothbrush.

Card 4

It had to happen. Uncle Morris finally departed this world. Doris never collected her items.

Write a letter to Max, the butler, telling him to pick up his possessions.

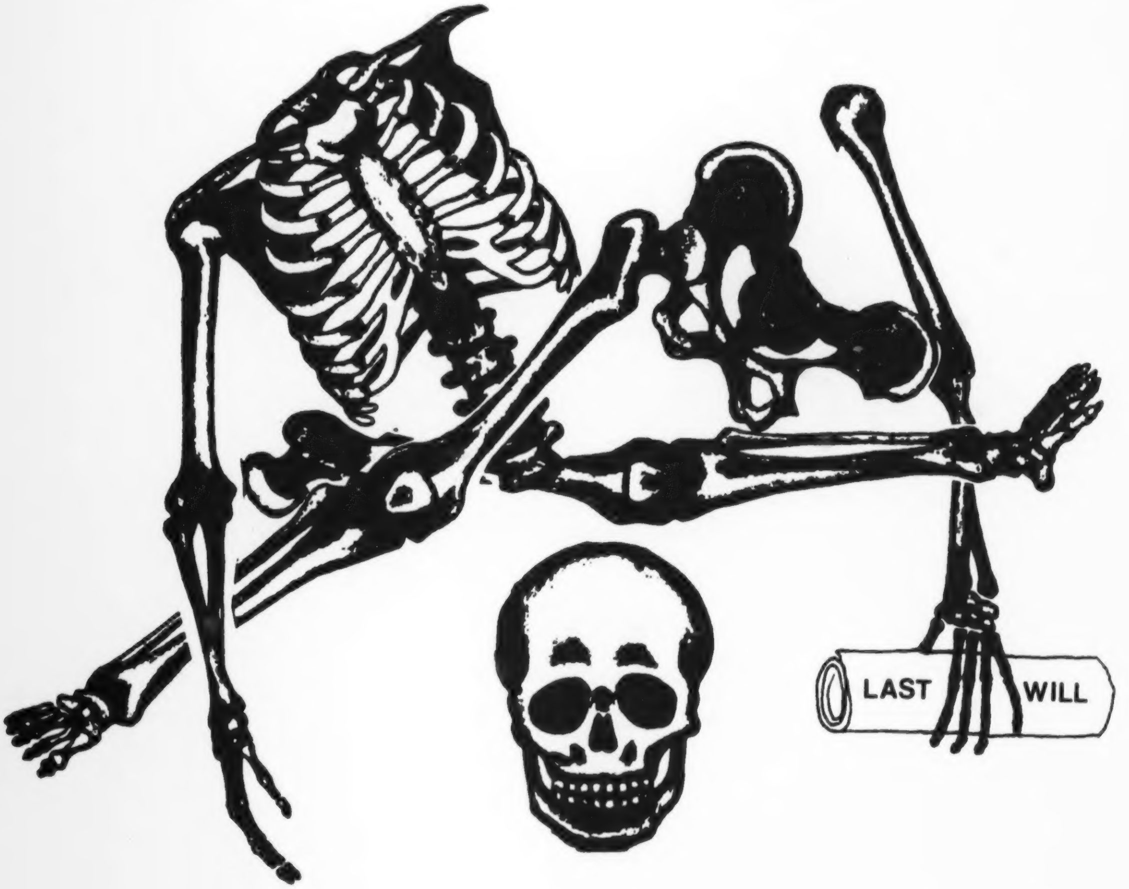
Save the letter for Posterity's sake. (She's Max's daughter.)

3. Instruct students to use the word processing program to load the data file called MORRIS and then to complete the tasks in order as identified on the cards.

4. Students should save their final versions of the will and their letters to Max, the butler, under their own name or initials.

EXTENSIONS:

Students should be encouraged to use the word processing manual whenever they wish to involve a new process in their "creations." Perhaps students might like to underline or italicize portions of the letter to Max if such enhancements are available using their word processor.



(Courtesy Scholastic-TAB Publications, from Boudrot, T.E., Word Processing Primer, Teaching and Computers, March, 1984.)

WHO DUN IT?

IV-T1-6
Level 2
H-o/TU
P.1 of 3

DIRECTIONS:

1. The teacher should create a data file called MYSTERY, as found on page 3 of this activity, on a data diskette using word processing software. The DIRECTIONS to the students should be stored in this file. Each microcomputer must be supplied with its own MYSTERY data diskette. Make certain that the write-protect notch on the data diskette has not been covered since students will be saving their "collective" creations on each data diskette.

2. As a lead up to this activity, teachers may wish to explore the possibility of writing a short "collective" paragraph in class. The teacher might ask the first student in each row to write the following two sentences or one of the teacher's/student's own creations on a piece of foolscap.

   "In the distance, the sound of a siren broke the stillness of the night. As the intensity of its shrillness increased, I wondered what it could mean . . ."

   Ask the first person in the row to write at least three more lines as a continuation of the story. Once completed, the student should fold the foolscap in such a way that only the last line can be viewed. The sheet is then passed to the next person in the row who continues the story WITHOUT LOOKING AT THE PREVIOUSLY WRITTEN MATERIAL. Each student, in turn, continues writing three or four lines, folds over the foolscap showing only the last line, and passes it on to the next person. The last person in the row writes two or three lines which concludes the "collective story" and then reads the creation to the rest of the class.

3. Prior to completing a "collective story" using word processing software, teachers may wish to review how blocks of text can be deleted, how data files can be saved to diskette and how one's final creation can be printed.

4. Students should be arranged in writing teams of two or three and a schedule should be determined so that all students can gain access to available microcomputers.

5. The first team of students should load the MYSTERY data file into each microcomputer and read the directions on the screen. Teachers may wish to have the directions and the initial paragraph of MYSTERY duplicated as a "hand out."

IV-T1-6
Level 2
H-o/TU
P.2 of 3

6. Each member of the writing team should continue the story by typing in a predetermined number of sentences. Once all team members have entered their contribution, which should consist of at least 10 lines on the screen, the RETURN or ENTER key must be pressed several times so that only the last two or three lines of their portion appear at the top of the screen. These "visible" lines should provide sufficient hints for the next student.

7. Teachers should ask the next writing team to move to an available microcomputer and to continue the story WITHOUT LOOKING BACK at the "hidden" text.

8. The collective story should be continued on each microcomputer by each new writing team until all students have had an opportunity to contribute to the story.

9. When the last team has concluded the story, they should delete any blank lines which exist between portions, delete the directions at the beginning and replace "TO BE CONTINUED. . ." with an interesting title of their own choosing.

10. This story should be saved on diskette using a unique file name and then the diskette can be transferred to a microcomputer connected to a printer. Finally, the "collective" mystery should be printed and read out to all participants.

DIRECTIONS:

This activity can be used by groups of students to write a "collective" story. The first group to use the word processor must continue writing the story which appears at the end, following the stars.

Within each group, partners should alternate typing in sentences or portions. Once each group has entered their "unit" which must consist of at least 10 lines, the RETURN key must be pressed several times so that only the last two or three lines of their portion appear at the top of the screen. These "visible" lines should provide sufficient hints to the previously written "hidden" portion.

The next group should move to the microcomputer and continue the story WITHOUT LOOKING BACK at the "hidden" text.

This process continues until all groups have had a chance to enter their text. After the last group has concluded the story, they should delete any blank lines which exist between portions, delete these directions and replace "TO BE CONTINUED . . ." with an interesting title of their own choosing. The story should then be saved on diskette using a unique file name so that the story can then be transferred to a microcomputer connected to a printer. Finally, the "collective" story should be printed and read to all participants.

***** "TO BE CONTINUED . . ." *****

At the end of the hallway, a dagger of light knifed its way under the graffiti-covered door. I inched towards the door expecting the worst! Nearby a cat howled as if in warning and a TV blared its commercial secret on how to get "whiter teeth." I knocked at the door as my blood turned to ice . . .

CONSTRUCTING THE DATABASE

IV-T2-1
Level 2
TU
P.1 of 6

DIRECTIONS:

This activity is intended to compare a method of hand-sorting information with that of computer manipulation of information. In order that students appreciate the speed at which the computer can sort and retrieve data, it is recommended that students carry out some of the functions of the computer database by hand-sorting file cards which are made from the blank record "master" found on page 3 of this activity.

1. The teacher should acquire and become familiar with a simple database management software system.

2. Using the database software, the teacher should create the "FAST FOOD" template as shown on page 3 of this activity.

3. Divide the class into small groups of 2 or 3 students.

4. Distribute a copy of the Table of Records, found on page 4 of this activity, to each group of students. This contains all the raw data for each of the 38 records.

5. Distribute 38 copies of the blank file cards (page 3) to each group.

6. Each group of students should transfer the information (raw data) for the 38 records from the Table of Records onto the blank file cards. Examples of completed cards are found on page 6. Each group will have a complete file card database. The teacher should stress that each dash of each field contains only a single character of information.

   For example:

   PRICE: 0 . 6 5 _ _ _

   NOTE that in this particular field, the price should be entered as a numeric decimal valve without a dollar sign ($) or cent sign (¢).

7. The teacher may wish to have the information for the 38 records already entered in the computer database, or alternatively, may wish to involve the students in the construction of the computer database.

   If students are to participate in entering information into the computer database, the teacher should demonstrate the procedure for entering data into the fields of each record. Then, every student enters a record(s) until all 38 records are in the computer database.

264

8. As a conclusion to this activity, the teacher should stress that the information in a database is only as reliable as the entry process.

Teachers may wish to have each group of students check the file cards of another group or the records in the computer database focusing on the contents of each field. It should be stressed that the computer cannot decide on the validity of an entry. Thus, if a hamburger costs 1.29 but is entered in error in reverse as 9.21, the computer will accept the entry without question. This phenomenon has been identified using the computer acronym GIGO. Some people think this stands for Garbage In Gospel Out, when in fact it really means

Garbage In Garbage Out!

Teachers should emphasize that unless the information contained in a database is accurate, the database cannot be used effectively. This has implications for the vast quantities of personal information contained in national and international computer databases.

Food Item: ____________________________

Chain: ______________________________

Serving Size (g): _______ Calories: ________

Protein (g): ___________ Fat (g): ________

Carbohydrate (g): _______ Calcium (mg): ______

Iron (g) ______________ Vitamin A (IU): ____

Vitamin C (mg): ________ Price: _________

Food Item: ____________________________

Chain: ______________________________

Serving Size (g): _______ Calories: ________

Protein (g): ___________ Fat (g): ________

Carbohydrate (g): _______ Calcium (mg): ______

Iron (g) ______________ Vitamin A (IU): ____

Vitamin C (mg): ________ Price: _________

TABLE OF RECORDS

In the following table, the prices have not been included since they would quickly become outdated. Teachers should ask students to provide current prices for most "Fast Food" items and to calculate the current price for remaining items based on serving size. Once the prices for all foods have been determined, the information found in this table should be distributed to students.
LEGEND: Serv. = serving size; Cal. = calories; Prot. = protein; Carb. = carbohydrate; Cal. = calcium; Vit. A = Vitamin A.

		Serv. (g)	Cal.	Prot. (g)	Fat (g)	Carb. (g)	Cal. (mg)	Iron (g)	Vit. A (IU)	Vit. C (mg)	Price
Burger King	Whopper	250	606	29	32	51	37	6.0	641	13.0	
	French Fries	75	214	3	10	28	12	1.0	0	16.0	
	Milkshake	305	332	11	11	50	390	0.2	9	tr	
	Cheeseburger	104	305	17	13	29	141	2.0	195	0.5	
Champs	Drumstick	54	136	14	8	2	20	0.9	30	0.6	
	Thigh	97	276	20	19	12	39	1.4	74	1.0	
Dairy Queen	Ice Cream Cone	213	340	52	10	10	300	tr	400	tr	
	Deluxe Hamburger	213	470	28	24	36	111	5.2	0	2.5	
	Cheeseburger	213	553	32	30	38	268	5.2	495	2.3	
	Onion Rings	85	300	6	17	33	20	0.4	0.01	2.4	
	French Fries	113	320	3	16	40	0.01	0.4	0.01	4.8	
	Malt	588	840	22	28	125	600	5.4	750	6.0	
	Mr. Misty Float	404	440	6	8	85	200	tr	120	tr	

Con't.

IV-T2-1
Level 2
TU
P.4 of 6

TABLE OF RECORDS

		Serv. (g)	Cal.	Prot. (g)	Fat (g)	Carb. (g)	Cal. (mg)	Iron (g)	Vit. A (IU)	Vit. C (mg)	Price
Grocery Store	Apple	150	87	0.45	0.6	22.9	9	0.45	135	7.5	
	Milk	244	166	8.54	9.5	11.9	288	0.24	390	2.4	
	Orange	215	70	1.9	0.4	24.1	71	0.9	408	105.4	
	Banana	150	132	1.8	0.3	34.5	12	0.9	645	15	
	Egg	54	77	6.9	6.2	0.38	29.2	1.5	615.6	0	
	Raisins	160	430	3.7	0.8	113.9	125	5.3	80	0.02	
	Cheese	28	105	23.2	8.4	0.56	188	0.25	364	0	
	Orange Juice	251	339	2.0	0.5	27.9	25.1	0.75	251	105.4	
	Carrot	110	45	1.32	0.22	10.2	43	0.9	1320	4.4	
	Coffee	230	9	0.46	0	1.6	9.2	1.15	0	0	
	Apple Juice	249	124	0.25	0	34.4	14.9	1.24	99.6	2.5	
	Chocolate Bar	48	240	2.9	16.1	26.7	103.4	1.92	72	0	
	Cola	355	170	0	0	42.6	0	0	0	0	
	Potato Chips	50	270	3.35	18.6	24.6	15	0.95	25	5.5	
	Popcorn	14	54	12.7	5.0	76.7	11	2.7	0	0	
	Diet Cola	355	1.5	0.18	0	0	0	0	0	0	
McDonalds	Cheeseburger	114	306	16	13	31	158	2.9	372	1.6	
	French Fries	69	211	3	11	26	10	0.5	52	11	
	Egg McMuffin	132	352	18	20	26	187	3.2	361	1.6	
	Milkshake	289	323	10	8	52	346	0.2	346	2.9	
	Big Mac Hamburger	187	541	26	31	39	175	4.3	327	2.4	
	Apple Pie	91	300	2	19	31	12	0.6	69	2.7	
Pizza Hut	Supreme Pizza	200	640	36	22	74	400	7.2	1000	9.0	
	Pepperoni Pizza	190	560	31	18	68	400	5.4	1250	3.6	
	Cheese Pizza	175	560	34	14	71	500	5.4	1000	1.2	

IV-T2-1
Level 2
TU
P.5 of 6

Fast Food Database Screen Layout

Food Item: WHOPPER
Chain: BURGER KING
Serving Size (g): 250 Calories: 606
Protein (g): 29 Fat (g): 32
Carbohydrate (g): 51 Calcium (mg): 37
Iron (g) 6.0 Vitamin A (IU): 641
Vitamin C (mg): 13.0 Price: ________

Fast Food Database Screen Layout

Food Item: FRENCH FRIES
Chain: BURGER KING
Serving Size (g): 75 Calories: 214
Protein (g): 3 Fat (g): 10
Carbohydrate (g): 28 Calcium (mg): 12
Iron (g) 1.0 Vitamin A (IU): 0
Vitamin C (mg): 16.0 Price: ________

IV-T2-2
Level 2
TU
P.1 of 2

MANIPULATING THE DATABASE

DIRECTIONS:

Now that the construction of the computer database is completed from activity IV-T2-1 and each group of students has a complete set of file cards, the teacher could illustrate the differences between manipulating the data by hand or by computer. Teachers may wish to have students time the following processes so that they can compare the information handling speed of the computer with that of humans.

This activity is to be done as a class demonstration.

1. Have each group find one particular record from the file card database (e.g., French fries from McDonalds) and record the number of seconds necessary to locate that record. Discuss with students how much easier it would be to find individual records when the file is stored or arranged in some fashion other than when the file is randomly ordered.

2. Ask each group to hand sort the individual record cards of the "Fast Food" database according to alphabetical order of food items. How many seconds did this take? Determine the average time of the class to hand sort this data base. Approximately how long would it take to hand sort a database with 100 times as many records? 1000 times as many?

3. Using the computer, the teacher should demonstrate how to access the same record as that located in question 1. Again, the computer time and human times for retrieval should be compared. Is there a significant difference in time? Was it easier to find the item now that the records are in alphabetical order?

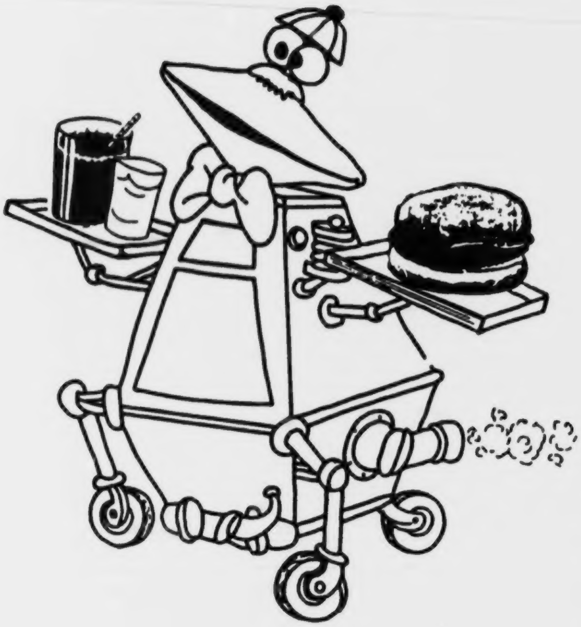
4. Now ask each group of students to hand sort their record cards in ascending order by calories. If the computer database has a sort utility, teachers could have the computer sort the records based on calories and then compare the time taken to complete this task by students and by computer.

5. Without rearranging the database cards, ask students to find out how many carbohydrates are in the food item from question #1 (e.g., the McDonalds French fries). The time necessary to retrieve this information should be recorded. Notice that finding the item is more difficult in the hand sorted database now that the order is in terms of calories, than when the order was alphabetical.

6. Use the computer to retrieve the original record in order to determine how many carbohydrates are included in that record. Compare the retrieval time of the student groups with the computer time.

7. Now ask student groups to hand sort the individual record cards according to price and to identify the most expensive item. Do the same sort and search using the computer version of the fast food database. Compare the relative ease of accomplishing this task by computer sorting versus hand sorting.

8. Now ask student groups to find the item with the lowest number of calories. Notice that this search is difficult because the hand sorted database has just been resorted according to price. Do the same sort and search using the computer version of the fast food database. This search is no more difficult for the computer because searches and sorts can be done on any field at any time. This makes the computer database significantly more flexible than the traditional physical filing system.



RETRIEVING INFORMATION FROM A DATABASE

IV-T2-3
Level 2
H-o
P.1 of 2

DIRECTIONS:

Using your computerized version of the "Fast Food" database, answer the following questions:

1. How many products are there from the chain:

   "Dairy Queen"? ______

   "Champs"? ______

   "Grocery Store"? ______

2. How many different "French Fries" are listed as separate food items?

   ______

   Which chains are these from? ______________________________

3. Find the food item with the most calories. ____________________

4. Which chain has a hamburger with the largest serving size? __________

5. Which hamburger has the fewest calories? ____________________

6. Find all the food items containing less than 1 milligram (mg) of Vitamin C?

   ____

   ____

   ____

   ____

IV-T2-3
Level 2
H-o
P.2 of 2

7. Which food item contains only carbohydrates? ____________

8. How many apples would one need to eat in order to gain the same amount of calcium as is found in two glasses of milk? ____________

9. How many diet colas would you have to drink to gain the same number of calories as there are in a regular cola? ____________

10. Compare the number of carbohydrates that are found in a regular and a diet cola. Explain the difference.

____

____

11. Explain the difference in the amount of protein that is contained within a regular and diet cola.

____

____

12. Could a person gain their recommended daily allowance of Vitamin C by eating only eggs? ________

IV-T3-1
Level 3
H-o
P.1 of 2

Getting to Know

TOOLCALC

DIRECTIONS:

1. Load the TOOLCALC program into your microcomputer.
2. Study the information and notes which follow and interact with the computer as directed.
3. Answer all questions in this activity.

ACTIVITY:

Study the spreadsheet display on the monitor. Notice the letters "A", "B", "C", and "D" which appear across the top of the screen. These pointers indicate the names of the spreadsheet columns whereas the numbers 1 through 19 down the left side of the screen refer to specific rows.

At the intersection of any column and row is a storage cell which is identified by its respective coordinates such as "A1", "D7", or "B12". When the spreadsheet program is first loaded, a rectangular bar or cursor highlights storage cell "A1".

Although one is able to see through a "window", containing only 4 columns (default value) and 19 rows, the window which exposes the 4 x 19 or 76 storage cells can be scrolled either horizontally or vertically in order to view other areas beyond the top left corner.

Press the space bar several times and notice what changes occur at the top of the screen. The direction indicator at the top right of the screen should alternate between a "!" and a "-" with each press of the space bar. The vertical direction indicator represented by a vertical line or "!", allows one to move in a vertical direction on the spreadsheet whenever the "!" is displayed. Use the right arrow key "--→" to move down the screen and the left arrow key "←--" to move the cursor up the screen. When the direction indicator has been "toggled" and a horizontal line "-" is displayed, the right arrow key "--→" moves the cursor to the right and the left arrow key "←--" moves the cursor to the left.

IV-T3-1
Level 3
H-o
P.2 of 2

Now that you can travel in both the vertical and horizontal directions by using the space bar to toggle the direction indicator and the left "←--" and right "--→" arrow keys to move, determine the size of the spreadsheet by answering the following:

1. How many columns are there? ______ They are lettered from A to what letter? ______

2. How many rows are there? ______ They are numbered from 1 to what value? ______

3. How many storage cells are contained within this electronic spreadsheet? ______

4. What key must be pressed in order to move the cursor through the spreadsheet to the right? ______
   to the left? ______
   to the top? ______
   to the bottom? ______

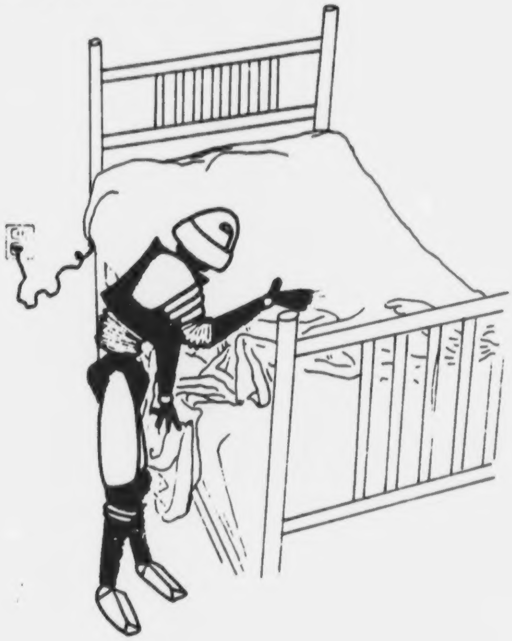
5. Which key is used to change the direction of cursor travel from a horizontal to a vertical position? ______

LOADing Your 'Plate'

IV-T3-2
Level 3
H-o/TU
P.1 of 2

DIRECTIONS:

1. Load the TOOLCALC program into your microcomputer and select the tutorial option which describes the process for loading a "template" on file.
2. Review this disk-based tutorial so that you are familiar with the process for selecting and loading a template.
3. Access the extended commands menu and scan the template and files.
4. Select the template on file named CARTOON and load it into the electronic spreadsheet workspace.
5. Decode the caption following the accompanying cartoon by revealing the words found in the indicated cells.



____ C12 ____ C3 ____ D10 ____ B12 ____ E3 ____ F4 ____ F10

____ F3 ____ C2 ____ B1 ____ A13

The teacher should enter this file as a template called CARTOON making certain that the width of each cell is set to 12 characters.

	A	B	C	D	E	F
1	THE	SPREADSHEET	IS	ONE	OF	THE
2	MOST	VALUABLE	ELECTRONIC	COMPUTER	PROGRAMS	AVAILABLE
3	TODAY	.	THIS	SOFTWARE	IS	AN
4	EXCITING	NEW	TOOL	WHICH	HAS	MEANT
5	HOURS	OF	TIME	SAVED	BY	ACCOUNTANTS
6	,	ENGINEERS	,	AND	OTHERS	INTERESTED
7	IN	COMPLEX	ARITHMETIC	ANALYSES	.	ONCE
8	ALL	PARTS	OF	A	PROBLEM	ARE
9	ENTERED	INTO	THE	PROGRAM	,	A
10	NEW	SITUATION	MAY	BE	CALCULATED	BY
11	CHANGING	THE	VALUES	ON	THE	GRID
12	.	WHAT	COULD	THE	FUTURE	HOLD
13	?					

IV-T3-2
Level 3
H-o/TU
P.2 of 2

HIDDEN PUZZLE

IV-T3-3
Level 3
H-o
P.1 of 2

DIRECTIONS:

1. Review the TOOLCALC tutorial in order to become familiar with the GOTO function.
2. Load TOOLCALC and the template/file called PUZZLE. Move the cursor to the specified cells to decode the message below.

A4 J16 B2 L12 C20

L5 D1 K4 F19

K9 M12 A2 L9

K6 N19 D19.

278

IV-T3-3
Level 3
H-o
P.2 of 2

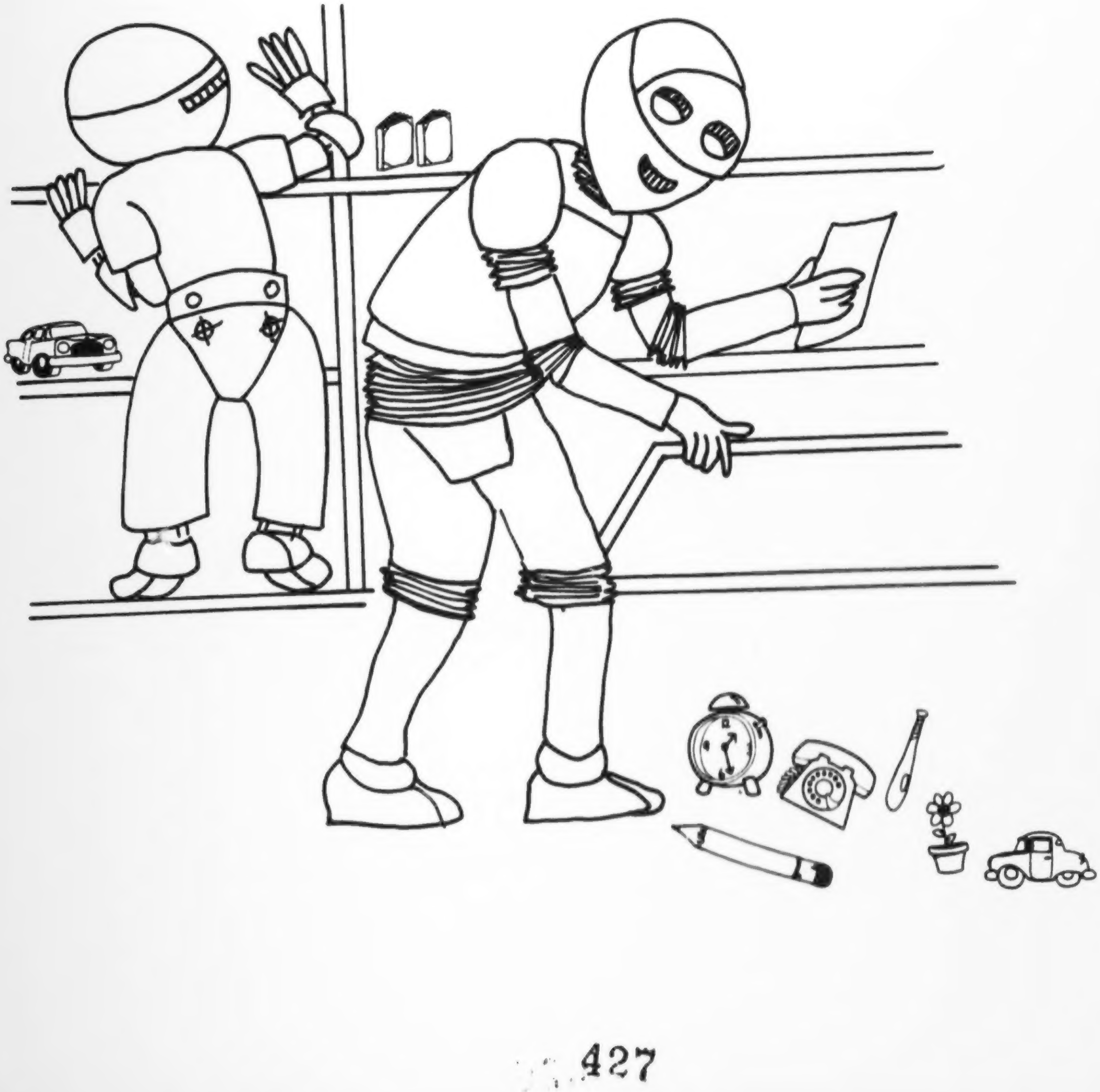
ANSWER TO "HIDDEN PUZZLE"

THE GOTO FUNCTION REALLY SPEEDS

UP ACCESSING INFORMATION IN

INDIVIDUAL MEMORY CELLS ON

AN ELECTRONIC SPREADSHEET.



COMPUTER LABELS

IV-T3-4
Level 3
H-o
P.1 of 2

DIRECTIONS:

1. Load the TOOLCALC tutorial segment which refers to the way in which information is entered into individual cells in a spreadsheet.

2. Study the process for blanking the contents of a cell if an error has occurred in entry.

3. Review the tutorial carefully to determine how spreadsheet data can be saved to diskette.

4. Using the TOOLCALC program, clear the screen, if necessary, and set the column width to 20.

5. In column B, enter your personal four line address label which includes:

   Name
   Address
   City, Province
   Postal Code

   Left-justify each entry in the cell (i.e., the first character of each line must begin at the extreme left side of the cell with any blanks or spaces appearing on the right side of the cell).

6. Now enter a similar four line address label in column D with each entry being right-justified so that any spaces that exist in each line precede or are located at the left side of each cell.

7. Once again enter the same four line address label in column F so that the contents of each cell are center-justified. In this format, there should be an equal number of blank spaces on both the left and right side of each cell surrounding the actual non-blank entry.

8. Have the teacher examine the electronic spreadsheet on your microcomputer and verify that the three mailing labels have been entered correctly.

9. Following approval by the teacher, use the extended command menu to access the SAVE function. Save your mailing label spreadsheet as a file called LABELS.

10. When the saving procedure is completed, examine the diskette catalog to verify that the LABELS file has been added. Return to the main spreadsheet and clear all entries.

11. To verify that the SAVE process was successful, use the extended command menu and retrieve the file called LABELS. Be prepared to demonstrate that you can successfully enter data, save it as a file, and retrieve it from diskette.

IV-T3-5
Level 3
H-o
P.1 of 2

CELL EXPLORATION

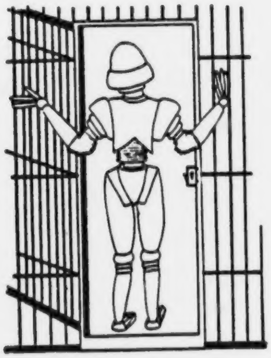
DIRECTIONS:

1. Load TOOLCALC into your microcomputer.
2. Review the tutorial component which discusses entering information. Make certain you know the difference between a value, an expression, and a label. Study the information on how expressions are entered and evaluated.
3. After completing the tutorial component, follow the directions below and answer the questions which are provided.

ACTIVITY

1. Using TOOLCALC or another electronic spreadsheet, enter the following values, labels, and expressions in the cells indicated:

Cell	Contents
A1	NUMBER1
A2	NUMBER2
A3	SUM
A4	DIFFERENCE
A5	PRODUCT
A6	QUOTIENT
B1	32
B2	8
B3	B1 + B2
B4	B1 - B2
B5	B1 * B2
B6	B1 / B2



2. When the expressions were entered into cells B3 to B6, what values were displayed in the cells:

B3 = ____________ B4 = ____________ B6 = ____________

3. Change the contents of cell B2 from 8 to 64 and, if necessary, recalculate to see the results change in cells B3 to B6. Explain what the contents of cell B4 are and why?

____

____

____

4. Place the label "AVERAGE" in cell A7 and enter the appropriate expression in cell B7 to determine the average of the contents of cells B1 and B2. What is the value which is displayed in cell B7 when this modification has been made? ________

5. Enter each pair of values found under B1 and B2 into the cells designated and then complete that row of the table, indicating the new values which appear following each new recalculation.

B1	B2	B3	B4	B5	B6	B7
500	25	____	____	____	____	____
160	160	____	____	____	____	____
100	33	____	____	____	____	____
18.2	9.1	____	____	____	____	____
0	50	____	____	____	____	____
19.673	14	____	____	____	____	____

"WHAT MARK DO I NEED..."

IV-T3-6
Level 3
H-o
P.1 of 1

DIRECTIONS:

1. Load the TOOLCALC program into your microcomputer.
2. Select the spreadsheet file called GRADES and load it into your workspace. Follow the directions and answer the questions which follow.

BACKGROUND:

The GRADES spreadsheet has already been designed to analyze the marks of four students. The marks assigned to the four terms, the exam and the final grade are all expressed as percents. The final mark is found by taking 60% of the exam mark and adding it to 40% of the sum of the four term marks. Assume that it is the middle of June and all term grades have already been determined. The final exam is to be written next week and you are to take on the role of the teacher and answer the questions which the following students ask. You might enter various numbers in certain cells to allow the electronic spreadsheet to predict the results and place your answers in the space provided.

1. John begins . . . "Teacher . . . what minimum mark do I need on my final exam in order to get at least 80% as my final grade so that I can be placed on the honour role?" ____________________
2. Michelle wants to know . . . "How low a mark can I get on my final exam and still get at least 50% as my final grade?" ____________________
3. Phillipe asks . . . "Suppose I turn in that incomplete assignment from term 4 which will raise my fourth term grade by 3 percentage points, what final exam mark must I get in order to get 65% for a final grade?"

   ____
4. Roger's question requires much more manipulation of the electronic spreadsheet when he states . . . "If John gets 65%, Michelle gets 80% and Phillipe gets 72% on their final exams, what is the lowest mark I can get on the final exam in order to get a final mark which is higher than that of the other three students? ____________________

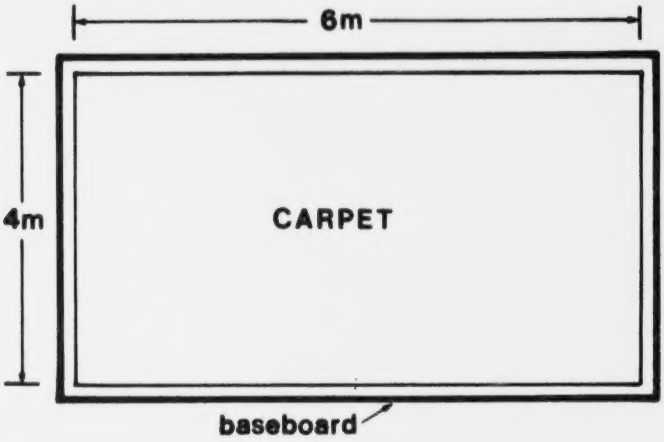
THE CARPET CAPER

IV-T3-7
Level 3
H-o
P.1 of 2

DIRECTIONS:

Prepare an electronic spreadsheet to solve the following carpet-baseboard problem. Use it to assist in the solution of the five problems found on page 2.

A rectangular room 6 m long by 4 m wide is to be carpeted using material priced at $29 per square metre. New baseboard priced at $3.25 per metre will surround the carpet. Calculate the total cost of materials for the project using the form below to show all steps.



1.	length		6 m
2.	width		4 m
3.	carpet price		$\$29/m^2$
4.	baseboard price		$3.25/m
5.	area	6 m x 4 m	________
6.	________	________	________
7.	________	________	________
8.	________	________	________
9.	________	________	________

1. The following problems are each based on the Activity IV-T3-7 spreadsheet data. Find the total cost of the project if:

   a) the length of the room is increased to 8 m.
   b) the carpet price is increased to $40/m^2$.
   c) baseboard price is $4.95/m.
   d) both room dimensions are doubled.

2. Suppose the homeowner has a maximum of $850 to spend on materials. Five grades of carpet are available. Of the carpet prices tested, decide which will fall within the price range of the project.

   a) $29/m^2$ b) $30/m^2$ c) $31/m^2$ d) $32/m^2$ e) $33/m^2$

   The baseboard price remains fixed.

3. Determine the maximum price per square metre which may be spent on carpet if the homeowner's cost of $850 is not to be exceeded.

4. This problem deals with the same carpet and baseboard spreadsheet solution developed above. Determine which costs more:

   a) carpetting a 6.2 m x 3.4 m room @ $29/m^2$ or
   b) carpetting a 5.3 m x 3.2 m room @ $31/m^2$

5. A homeowner has a choice of four home improvement projects each involving carpet and baseboard. If a maximum of $500 can be spent on materials, which of the following projects is NOT within the price limit? Which project will use the greatest portion of the budgetted $500 without exceeding it?

	Room	Dimensions	Carpet Price	Baseboard Price
a)	living room	5.8 m x 3.1 m	$29/m^2$	$3.25/m
b)	bedroom	3.9 m x 3 m	$30/m^2$	$2.50/m
c)	kitchen	4.2 m x 2.5 m	$39/m^2$	$2.25/m
d)	family room	8.2 m x 4 m	$15/m^2$	not used

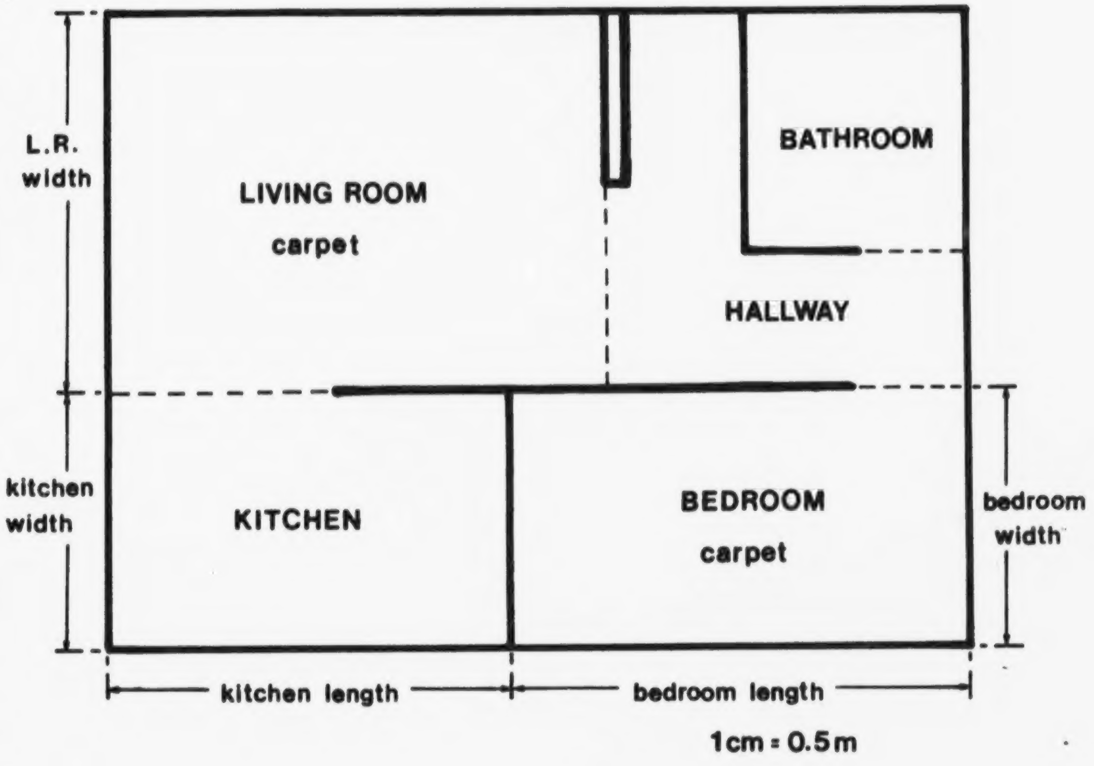
BUILDING A HOUSE

IV-T3-8
Level 3
H-o
P.1 of 6

DIRECTIONS:

Work in pairs or in small groups as directed by your teacher. Your group is contracted to finish a small home. The floor plan is given below. You have $ __________ in your budget to finish the floor and baseboards for the livingroom, kitchen and bedroom. The bathroom and hallway floor coverings have been included by the contractor. You are to set up a spreadsheet to determine the cost per room for baseboards and flooring in order to stay within your total floor covering budget.

FLOOR PLAN


L.R. width
LIVING ROOM
carpet
BATHROOM
HALLWAY
kitchen width
KITCHEN
BEDROOM
carpet
bedroom width
kitchen length
bedroom length
1cm = 0.5m

*If you are unable to finish, SAVE your spreadsheet template on diskette so you are able to continue later.

		B	C	D
1.		Label LIVINGROOM	Label KITCHEN	Label BEDROOM
2.	Label LENGTH	value	value	value
3.	Label WIDTH	value	value	value
4.	Label PERIMETER	formula	formula	formula
5.	Label TYPE OF BB	label	label	label
6.	Label COST/M BB	value	value	value
7.	Label COST/ROOM BB	formula	formula	formula
8.	Label AREA	formula	formula	formula
9.	Label TYPE OF FLOOR	label	label	label
10.	Label COST/SQ M FLOOR	value	value	value
11.	Label COST/ROOM FLOOR	formula	formula	formula
12.	Label TOTAL COST/ROOM	formula	formula	formula

1. Use a metric ruler to measure the dimensions of each room from the floor plan on the first page of this activity. Round your measurements to the nearest cm. Complete the following chart.

	LIVINGROOM	KITCHEN	BEDROOM
Length in cm from plan			
Width in cm from plan			
Scale factor 1 cm = 0.5 m	*2	*2	*2
True Length in metres			
True Width in metres			

Using the scale factor 1 cm from floor plan = 0.5 true metres, calculate the TRUE length and TRUE width of each room in metres. Record these values in the table above.

2. Load the electronic spreadsheet software into the computer. Leave cell A1 empty. Begin at cell B1 to create your template as shown on page 2 of this activity.

3. Each room needs a baseboard all the way around its perimeter. (For simplicity ignore the fact that baseboard is not needed at doorways.)

4. Choose the type of baseboard for each room from the list below (remember your budget).

TYPE	COST
Oak	$ ________/metre
Vinyl	$ ________/metre

Label Cell A5 with the Label: TYPE OF BB and enter your choice of baseboard for each room into cells B5, C5 and D5.

5. LABEL cell A6 with the Label: COST/M BB and enter the cost per metre of baseboard for each room from the list in question 4. These figures should be put into cells B6, C6 and D6.

6. Label cell A7 with the Label: COST/ROOM BB and enter your formula for the cost of baseboard material in the livingroom into cell B7. Do the same for the kitchen and bedroom by entering their formulas for baseboard cost into cells C7 and D7.

7. Each room needs some flooring material to cover its area. If the length of the livingroom is stored in cell ____ and the width of the livingroom is stored in cell ____, then what formula would be needed to find the area of the livingroom? __________

   Label cell A8 with the Label: AREA and put the formula for the area of the livingroom into cell B8. Do the same for the kitchen and the bedroom by entering their formulas for area into cells C8 and D8.

8. Choose the type of flooring material for each room from the list below (remember your budget):

TYPE	COST
Economy carpet	$ ______/sq. m
Plush carpet	$ ______/sq. m
Tile	$ ______/sq. m
Hardwood	$ ______/sq. m

   Label cell A9 with the Label: TYPE OF FLOOR and enter your choices of flooring material for each room into cells B9, C9 and D9.

9. Label cell A10 with the Label: COST/SQ. M FLOOR and enter the cost per square metre of flooring for each room from the list in question 8. These figures should be put into cells B10, C10 and D10.

10. If the area of the livingroom, in square metres, is stored in cell ___ and the cost per square metre of flooring material is stored in cell ____, then what formula would be needed to find the cost of flooring material for the livingroom? ____________ __

    Label cell A11 with the Label: COST/ROOM FLOOR and enter your formula for the cost of flooring material in the livingroom into cell B11.

11. Now that you have the cost for the baseboards in the livingroom stored in cell _____ and the cost for the flooring material stored in cell _____, the formula for calculating the total cost for the livingroom would be _______________.

    Label cell A12 with the Label: TOTAL COST/ROOM and enter your formula for the total cost for the livingroom into cell B12. Do the same for the kitchen and bedroom by entering their formulas for total cost into cells C12 and D12.

12. The total amount of baseboard for the entire house can be calculated by adding the perimeters of the three rooms found in cells ____, ____, and ____. Enter the formula for this calculation in cell E4.

13. Enter the formula for the total cost of baseboard for the three rooms in cell E7.

14. The total area of the floor of the house to be covered can be calculated by adding the areas of the three rooms found in cells _____, ____, and _____. Enter the formula for this calculation in cell E8.

15. Enter the formula for the total cost of flooring material for the three rooms in cell E11.

16. Enter the formula for the total cost of the project into cell E12. Check to see that this amount does not exceed your budget given in question ____.

17. Suppose your budget was reduced to ___________. Using your spreadsheet, change your choices of baseboards and/or carpeting to stay within your budget.

18. Suppose your budget was increased to ___________. Use your spreadsheet to upgrade your choices, still staying within your budget.

19. Suppose your budget was increased to _________. Keeping your choices constant, how large could you make the livingroom and still stay within your budget?

ANSWER KEY

IV-T3-8
Level 3
H-o
P.6 of 6

	A	B	C	D	E
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

SCAVENGER HUNT

V-2-1
Level 1
LA
P.1 of 1

DIRECTIONS:

Prepare a notebook containing fifteen of the items listed below. In addition, try to find four items relating to computers which are not on the following list.

*Computer printed grocery tape

*Sample of a Universal Product Code (UPC)

*Ad for a microcomputer

*Ad for a minicomputer

*Ad for a calculator

*Newspaper or magazine article about computers

*Cartoons about computers

*Computer-related job advertisement

*Computer-generated utility bill

*Ad for a computerized toy

*List of the uses for a computer

*List of future uses for a computer

*Cancelled bank cheque

*Printout of your initials done on a computer

*Glossary of computer terms

*Computer-generated "junkmail"

*Computer-generated airline ticket

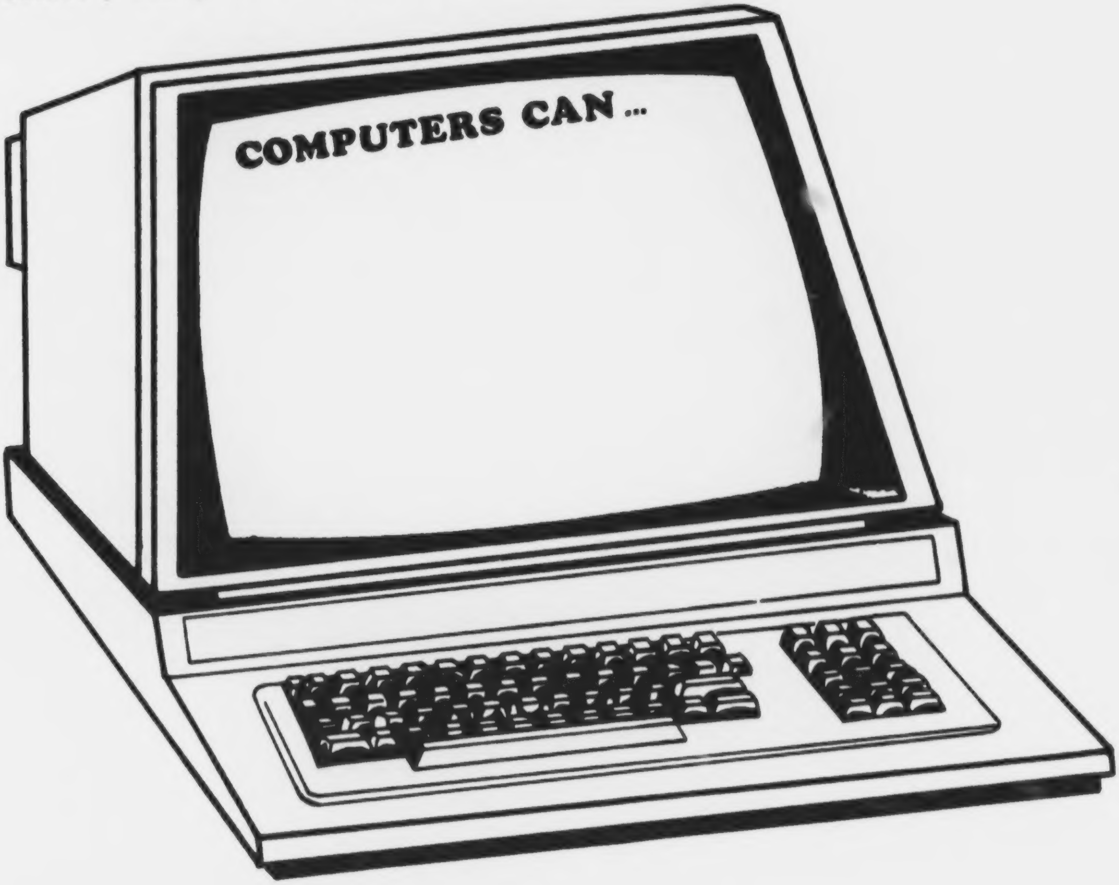
*Story about computers

COMPUTERS
CAN... CANNOT...

V-6-1
Level 2
LA
P.1 of 2

DIRECTIONS:

Identify things that computers can and cannot do.

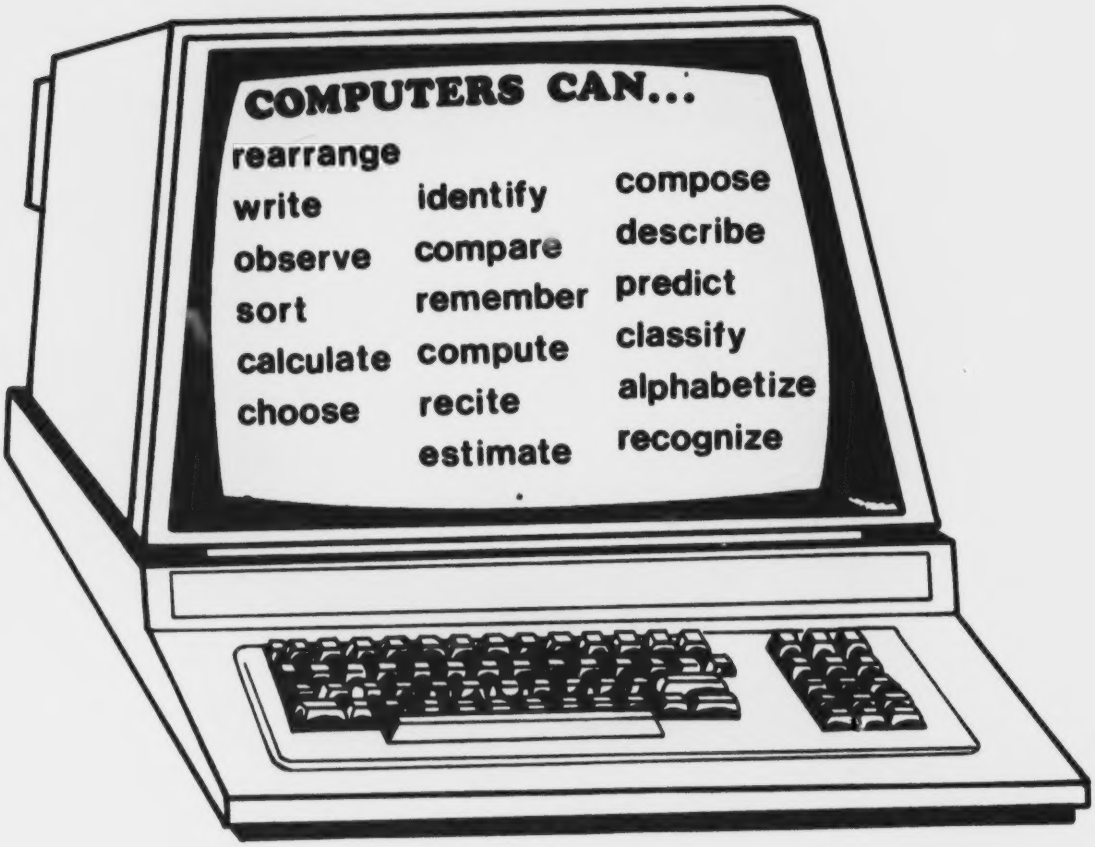

COMPUTERS CAN...

COMPUTERS CANNOT...

V-6-1
Level 2
LA
P.2 of 2

ANSWERS FOR

COMPUTERS CAN... CANNOT...



COMPUTERS CAN...

rearrange
write
observe
sort
calculate
choose
identify
compare
remember
compute
recite
estimate
compose
describe
predict
classify
alphabetize
recognize

COMPUTERS CANNOT...

guess
suffer
invent
forget
imagine
create
love
enjoy
judge

V-6-2
Level 3
LA/Ma/Sc
P.1 of 2

OPINIONNAIRE

DIRECTIONS:

Please indicate your view with respect to the following statements about computers. After reading each of the following statements carefully, circle:

1 if you strongly agree (SA)
2 if you mostly agree (MA)
3 if you are neutral or have no opinion (NO)
4 if you mostly disagree (MD)
5 if you strongly disagree (SD)

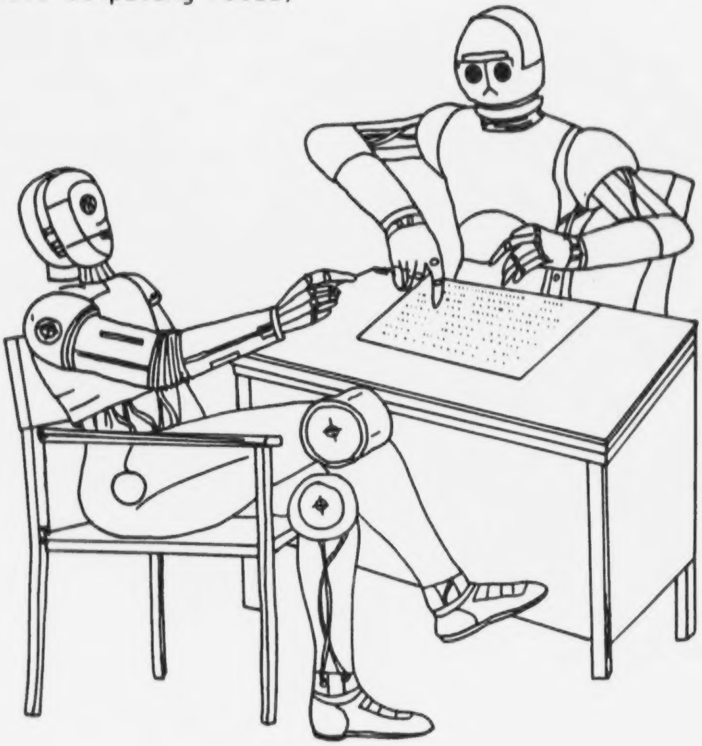
****

Statement	SA	MA	NO	MD	SD
1. Computers will improve health care.	1	2	3	4	5
2. Computers will improve education.	1	2	3	4	5
3. Computers will improve law enforcement.	1	2	3	4	5
4. Computers slow down and complicate simple business operations.	1	2	3	4	5
5. Computers are best suited for doing repetitive, monotonous tasks.	1	2	3	4	5
6. Computers make mistakes at least 10 percent of the time.	1	2	3	4	5
7. Programmers and operators make mistakes, but computers are, for the most part, error free.	1	2	3	4	5
8. Computers dehumanize society by treating everyone as a number.	1	2	3	4	5
9. It is possible to design computer systems which protect the privacy of data.	1	2	3	4	5
10. Credit rating data stored on computers has prevented billions of dollars of fraud. This is a worthwhile use of computers.	1	2	3	4	5
11. In Canada today, a person cannot escape the influence of computers.	1	2	3	4	5
12. Computers will create as many jobs as they eliminate.	1	2	3	4	5
13. Computers will replace low skill jobs and create jobs needing specialized training.	1	2	3	4	5
14. Computers are a tool just like a hammer or a lathe.	1	2	3	4	5

* * *

Statement	S A	M A	N O	M D	S D
15. Computers are beyond the understanding of the typical person.	1	2	3	4	5
16. Computer polls and predictions influence the outcome of elections.	1	2	3	4	5
17. Computers isolate people by preventing normal social interactions among people who use them.	1	2	3	4	5

(Coutesy of Creative Computing Press)



resource materials

ROLE OF RESOURCES

Being independent of any one resource, including both software and print, this curriculum document allows for greater flexibility in scope and approach than may be advocated by a particular author/authors. Teachers are encouraged to plan their own 7-9 Computer Awareness program using this document as a framework. More than one resource should be used at each grade level. No one text or courseware package should become the year's program. As most resources contain topics not included in this outline, teachers should not use a page-by-page approach.

It is exceedingly important that teachers have access to and become acquainted with various resources, as this provides for:

- flexibility in accommodating various student abilities and interest levels,
- a variety of content and methodology,
- alternate assignment suggestions and ideas,
- a greater variety of activities to introduce basic concepts and remediation, as well as enrichment suggestions.

MICROCOMPUTER COURSEWARE

The microcomputer chosen to support teaching and learning about computers in the 7-9 classroom should be capable of supporting most of the following types of courseware:

1. Logo or Logo-like computer languages,
2. robotics-control software to support robotic devices such as the "Tasman Turtle" or "TurtleTot",
3. word processing software such as "Bank Street Writer" or "Magic Slate",
4. graphics-based courseware such as "Mr. Pixel's Programming Paint Set", "Koala Micro Illustrator", "The Print Shop", "Bank Street Storybook", or "STORY MAKER: A Fact and Fiction Toolkit",
5. microcomputer simulations such as "Oh Deer!" or "The Factory",
6. tutorial courseware such as "Rocky's Boots" or "Robot Odyssey I",
7. integrated tool courseware such as "Apple Works" capable of word processing, data base management and spreadsheet analysis,
8. problem-solving software such as "The Incredible Laboratory" or "Problem Solving Strategies (MECC)",
9. drill-and-practice software such as "Music Theory", M-SS-NG L-NKS" or "Mastertype" as well as
10. sound-generating software such as "Songwriter" or "Bank Street Music Writer".

Further information concerning educational courseware can be obtained by referring to the Directory of Educational Courseware Evaluations. This Manitoba Education publication contains alphabetical listings of evaluated courseware and of courseware suppliers, as well as descriptive information on the courseware evaluated. The Directory may be borrowed from the Manitoba Education Library or the local school division office, or it can be purchased from the Manitoba Text Book Bureau.

PRINT MATERIALS

Print materials identified in this section were used and evaluated by 7-9 Computer Awareness pilot techers. Two types of information are presented:

1. An alphabetical listing by author of the print materials which pilot teachers found most useful, and
2. A brief annotation and identification of the strengths and weaknesses of each title.

Each title is coded to assist in identifying the supplier. Suppliers' codes and addresses are listed at the end of the Resource Materials section.

Teachers are advised that the list of print materials is not exhaustive and is representative of those materials found appropriate during the 1983-84 school year. Teachers should refer annually to the Manitoba Text Book Bureau Catalogue to obtain the latest information on recommended 7-9 Computer Awareness print materials.

Title: Abelson, Harold. Logo For the Apple II. Peterborough: BYTE, 1982. (MH)

Annotation: Teacher resource. This book deals with many aspects of learning and with using Apple Logo from beginning to advanced levels. Diagrams and projects are included.

Strengths:
. thorough coverage of Apple II Logo

Title: Bearden, Donna, Kathleen Martin and Jim Muller. The Turtle's Sourcebook. Reston: Reston Publishing Company, Inc., 1983. (PH)

Annotation: Teacher reference. Contains information on TI, Apple and MIT Logos. Numerous activities, both hands-on and hands-off.

Title: Billings, Karen and David Moursund. Are You Computer Literate? Beaverton: Dilithium Press, 1979. (HRW)

Annotation: Used as a teacher resource, this book discusses what a computer is, the history of computers, data entry and computer programming, present uses of computers, and how computers affect people. A good introduction to computer awareness.

Strengths:
- well written in everyday language
- covers wide range of computer topics
- good social impact section

Weaknesses:
- some outdated information

Title: Heller, Rachelle and Diane Martin. Bits'n Bytes Gazette. Rockville: Computer Science Press, 1983. (CSP)

Annotation: A set of ten eight-page computer newspapers containing articles and activities for students. The articles discuss current uses of computers, historical highlights and careers in computers. Some BASIC programming concepts are included:

Strengths:
- attractive, newspaper format
- diverse, interesting articles for students
- cross referenced to "Bits 'n Bytes About Computing: A Computer Literacy Primer"

Title: Carlson, Edward H. Kids and the Apple. Reston: Reston Publishing, 1982. (PH)

Annotation: Contains 33 lessons in BASIC programming each containing notes to the teacher, assignments and review questions. Includes graphics examples, a glossary and an answer key. A complete course in BASIC programming for the Apple microcomputer. Suitable for grades 7-9.

Title: 101 Activities for Computer Classes. Minneapolis: Minnesota Educational Computing Corporation (MECC), n.d. (ETP)

Annotation: Contains 101 activity sheets dealing with computer classroom management, computing history, computers in society, computer concepts, number systems and programming. A complete set of answers is provided. Not machine specific.

451

452

Title: Papert, Seymour. Mindstorms. New York: Basic Books, 1980. (FW)

Annottion: Mindstorms is based on the premise that the interaction of a student and a computer will foster intellectual thought and reasoning. This is an indepth examination of the philosophy of Logo.

Strengths:
- very good explanation of the theoretical background of Logo
- helpful hints on turtle graphics
- outlines the value of Logo

Weaknesses:
- much of the book is devoted to Piaget's theories
- dry reading
- lacks practical ideas

Title: __________. Teacher's Guide for 'Spotlight on Computer Literacy'. New York: Random House, 1983. (MTBB)

Annotation: Contains chapter notes, vocabulary, activities and answers to questions found in the textbook.

Title: Richman, Ellen. Spotlight on Computer Literacy. New York: Random House, 1983. (MTBB)

Annotation: Software textbook suitable for student use. Contains three units. Unit 1 discusses different types of computers--the parts of a computer and what makes computers work. The second unit examines historical inventions which led to the development of modern computers and identifies computer applications in business, government, education, and the home. Unit 3 deals with reading and writing BASIC language programs. This is a highly recommended non-machine specific resource.

453

Title: Spencer, Donald D. The Illustrated Computer Dictionary (Revised Edition). Columbus: Charles E. Merrill Publishing Co., 1983. (MER)

Annotation: Compact and concise dictionary of terms commonly used by computer users. All definitions are simply stated. Illustrated.

454

Title: Watt, Daniel. Learning with Logo. New York: McGraw-Hill, 1983. (MH)

Annotation: Highly recommended as a teacher and student resource. Set up in three parts dealing with an introduction to Logo, procedures using inputs and variables, and projects. Written for the Terrapin/Krell version of Logo with appendices for Apple Logo and TI Logo.

Stengths:
- clearly written
- cartoon characters give continuity and make information easy to find
- coil binding allows book to lay flat when in use
- organization and layout are excellent

SUPPLIERS' CODES AND ADDRESSES

Computer Science Press Inc.
11 Taft Court
Rockville, Maryland 20850 .... CSP

Educational Technology Program
1970 Ness Avenue
Winnipeg, Manitoba R3J 0Y9 .... ETP

Fitzhenry & Whiteside
195 Allstate Parkway
Markham, Ontario L3R 4T8 .... FW

Holt, Rinehart & Winston of Canada Ltd.
55 Horner Avenue
Toronto, Ontario M8Z 4X6 .... HRW

Manitoba Text Book Bureau
277 Hutchings Street
Winnipeg, Manitoba R2X 2R4 .... MTBB

Charles E. Merrill Company
230 Barmac Drive
Weston, Ontario M9L 2X5 .... MER

McGraw-Hill Ryerson Ltd.
330 Progress Avenue
Scarborough, Ontario M1P 2Z5 .... MH

Prentice-Hall Canada Inc.
1870 Birchmount Road
Scarborough, Ontario M1P 2J7 .... PH